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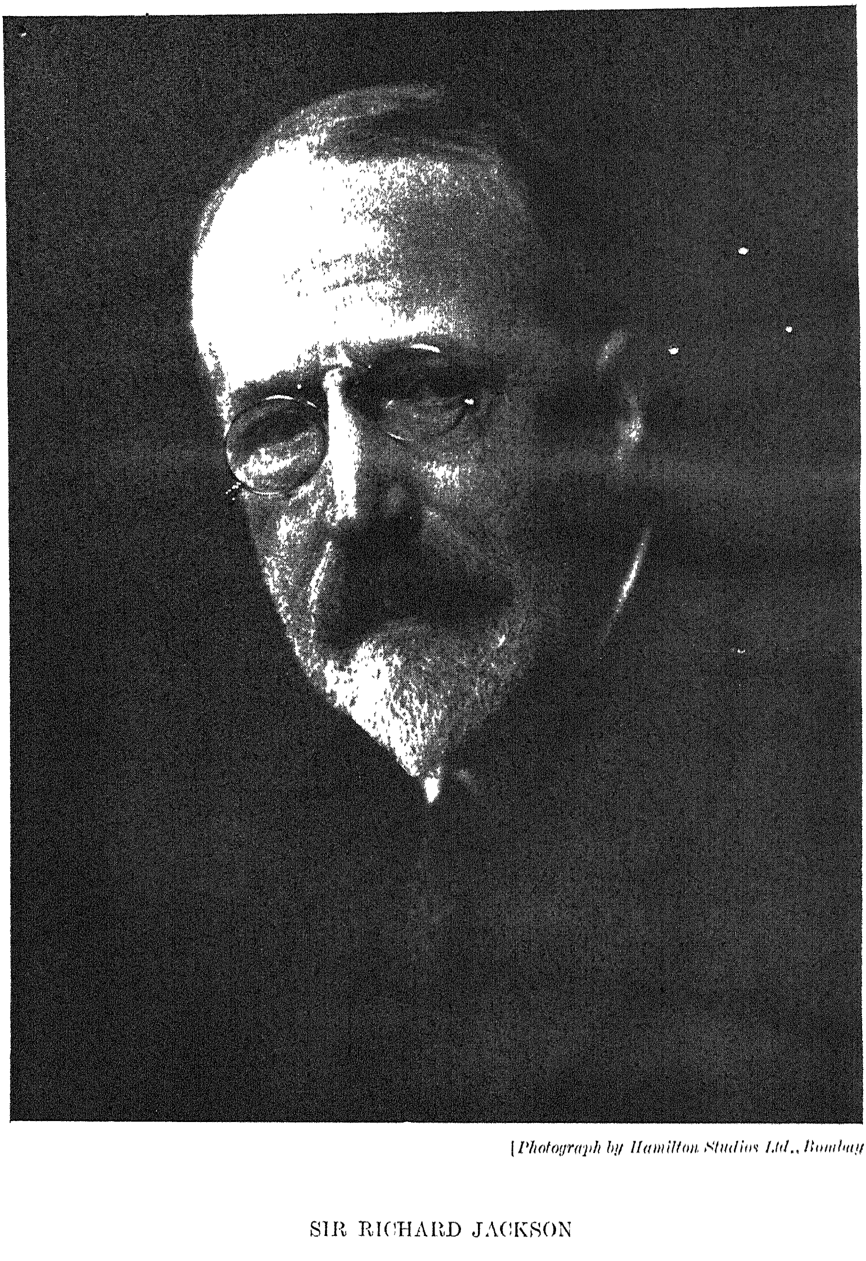

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SIR RICHARD JACKSON

THE EMPIRE COTTON GROWING REVIEW

ABSTRACT NUMBER

VOL. XXI. JUNE, 1944 No. 1

WE have to record with deep regret the death, since our last issue, of Sir Richard Jackson, J.P., Chairman of the Administrative Council of the Corporation; of Mr. J. S. Addison, Chairman of the Scientific Advisory Committee; and of Sir John Farmer, F.R.S., a member of the Committee until 1939.

SIR RICHARD JACKSON

When Sir Richard succeeded Mr. J. W. McConnel in 1922 as Chairman of the Administrative Council and Executive Committee of the Corporation, he had already been for many years closely connected with the efforts made to increase cotton production in the Empire. In 1909 he had been elected a member of the Council and Executive Committee of the British Cotton Growing Association as one of the representatives of the Federation of Master Cotton Spinners Associations; this membership he retained until the day of his death.

In 1917 the President of the Board of Trade appointed a Committee "to investigate the best means of developing the growing of cotton within the Empire and to advise the Government as to the necessary measures to be taken for this purpose." Sir Richard was one of the members of this Committee, on the recommendation of which the Corporation was established in 1921.

With a view to facilitating changes, if so desired, in the representatives appointed by the various bodies who have the right to nominate members of the Council, the By-Laws of the Corporation lay it down that the non-official representatives shall not hold office for more than three years at a time. The fact that Sir Richard was unanimously re-elected as Chairman no less than six times, and thus held the chief executive position in the Corporation continuously for over twenty-one years, bears eloquent testimony to the universal esteem in which he was held and to the successful way in which, under the Presidency of Lord Derby, he guided the policy of the Corporation.

During the first eleven years of his Chairmanship Sir Richard was in control of the family spinning firm and had other business interests. In spite of all that this involved and of the anxieties that beset all connected with the cotton trade in the years of trade depression around 1930, the London office had never to wait for his decision on the numerous questions submitted to him. In later years, after the death of Sir James Currie, the Chairman's work increased very considerably. No successor to Sir James as Director was appointed, and all questions of major importance were submitted to the Chairman, who either gave his ruling on the point at issue or decided that it was sufficiently important to be referred to the Executive Committee.

Sir Richard's success as an administrator largely lay in his attention to detail, his far-sightedness, his innate kindliness and in his eminent fairness and justice. How often have we heard him say, when some request from a member of the overseas staff was under discussion, "I should like to do that, but it could only be done if the principle were applied to every member of the staff, present and future."

In his public work Sir Richard's energies were by no means devoted entirely to the work of the Corporation. In addition to his duties as a magistrate and as a member of the Executive Committee of the British Cotton Growing Association, he was a member of the Colonial Development Advisory Committee from 1929 to 1938, and received a knighthood in 1932. In that year also, after attending the Ottawa Conference as a member of the United Kingdom Cotton Trade Advisory Delegation, he was invited by the President of the Board of Trade to act as Chairman of the Lancashire Indian Cotton Committee, whose efforts achieved considerable success in promoting the increased use of Indian cotton in the United Kingdom. In this connection Sir Richard made two tours in India in 1934 and 1936. He had previously visited the Sudan in 1926, in order to acquire first-hand knowledge of some of the problems of cotton-growing under irrigation, and to be present at the formal opening of the Makwar Dam. In 1933 he visited the Corporation's Experiment Stations in South Africa, Rhodesia and Nyasaland.

By Sir Richard's death the Corporation have lost a very wise Chairman and the Council have recorded elsewhere their appreciation of the great services he rendered in that capacity. We should like to add here on behalf of the staff our sense of loss at the death of a kindly friend. To Sir Richard it was not enough that the staff should know that they had access to him; it was a standing instruction from him that whenever possible he wished to meet any member of the staff on leave, and all those who thus met him at the London office and those who attended the Corporation's Cotton Conferences in 1930, 1934 and 1938 will have retained in their memories of their talks with him a vivid

impression of the keen interest he took in the work they were doing and in their personal careers.

Throughout his tenure of the Chairmanship, and more especially since Sir James Currie's death, he interpreted his duties to include those of *paterfamilias* to us all, and the wording of the numerous letters written by members of the staff abroad when the news of his death reached them testifies to the complete success with which his efforts were rewarded.—L. G. K. and J. C. M.

JAMES STANLEY ADDISON

Mr. Addison was one of the members of the Empire Cotton Growing Committee of the Board of Trade, whose Report led to the establishment of this Corporation. He was nominated as one of the original members of the Council in the Corporation's Charter, and was by them appointed their first Vice-Chairman and a member of the Executive Committee.

When his connection with the cotton trade became less intimate on his retirement from the Calico Printers' Association to join the firm of Courtaulds, he resigned from the Vice-Chairmanship, but, being anxious not to lose his valuable services, the Council made him a co-opted member and continued annually until his death to elect him to the Executive Committee.

Mr. Addison always interested himself particularly in the Corporation's scientific work, and in 1922, when a committee was appointed under the title of the Research and Training Committee, Mr. Addison became its Chairman, a post which he continued to hold when the Committee was reconstituted as the Corporation's Scientific Advisory Committee. Valuable as his opinion was on all matters of general policy that came before him as a member of the Executive, it was as Chairman of the Scientific Committee that he rendered his most distinguished services to the Corporation. In spite of the heavy pressure of other work, both in his business and on more than one Government committee, especially since the outbreak of war, he never failed to find time to read and annotate the voluminous papers that he received in connection with the Corporation's scientific work; he took an especially keen and critical interest in the re-shaping and development of their scientific policy which led them in 1942 to submit to the Executive a report in which they recommended the Corporation to concentrate in East Africa their principal work on cotton research and experimentation, and to establish after the war a Central Cotton Research Station in Uganda. He supported this project with enthusiasm and gave generously of his time to the study of the many intricate problems which it involves. When the Central Station is in

being it may well be regarded as a lasting memorial to Mr. Addison's foresight and judgment, and to his keen interest in the Corporation's work in years to come.—L. G. K.

Such is the record of the fine part Addison played in promoting the scientific development of cotton growing in the Empire. But in the minds of the Scientific Advisory Committee there abide memories transcending all this: of respect and of affection. He had those rare gifts which enable a layman to grasp technical issues arising in the application of science, and the temperament and personal command under whose influence the discussions and, on occasion, the disputations of the scientific are able to run smoothly to fruitful conclusions. He liked scientists: he was never known to say so, but he so instinctively saw their point of view and supported them as to make them turn to him as a friend. He was an admirable Chairman of the Committee: its members will, indeed, look back on him as ideally cast for that part. Even so, their grateful recollection contains more than such a tribute expresses. For the quality of the man made a yet deeper, more intimate, impression than even the execution of his work. Complete integrity, toleration, courage, stability, kindness, a profound common-sense and withal a wonderful modesty, are seldom combined in any man. He had them all. His very figure and carriage betokened them: they shone on his face.—F. L. E.

SIR JOHN FARMER, F.R.S.

By the death of Sir John Farmer on January 26th the Corporation has lost one who gave it invaluable help, especially in its early years.

John Bretland Farmer was born in 1865, and from his earliest years was familiar with the countryside and country pursuits. After a brilliant career at Oxford, where he became a Fellow of Magdalen, he was appointed at the age of thirty Professor of Botany at the Imperial College of Science and Technology, London, a post which he retained until his resignation in 1929. He was knighted in 1926.

Farmer was the first holder of a University chair in this country to apprehend the value of applied botany and to realize the important part that it could play in the plantation industries of the Empire as well as in agriculture at home. He developed this liaison with such success that not only did many of his old students hold important positions in agriculture in the Dominions and the Colonial Empire, but his services were constantly in demand for advice on matters of "plant technology," both at home and overseas.

Farmer was a member of the Corporation's Scientific Committee from 1922 onwards, resigning only in 1939. He held strongly the view that the Corporation should establish a centre for fundamental research

on the cotton plant, and, to investigate the possibilities of Trinidad as a site for such a Station, at the request of the Corporation, he and Mr. L. G. Killby visited the West Indies in 1925. As a result of their report the present Research Station in Trinidad was set up in 1926.

Farmer also gave invaluable advice and help in the establishment of the Corporation's Post-Graduate Studentship Scheme, and in the selection of candidates for the studentships. It is largely owing to his skill in the selection of men that the Corporation has such a remarkably effective team of workers. He was also a member of the London Advisory Committee on Agricultural Research in the Sudan and visited that country to report on the reorganization of agricultural research there, at the invitation of the Sudan Government.

It is impossible here to do more than make mention of his services to agriculture in this country, but a brief reference is appropriate to the assistance he gave to the development of tropical agriculture by the part he played in the work of the Committee appointed by the Secretary of State for the Colonies under the Chairmanship, first of Lord Milner and later of Lord Lovat, to enquire into the training of agricultural officers for the Colonies. That Committee's report led to the adoption of an entirely new system of recruitment for the Colonial Agricultural Service by means of the establishment of post-graduate scholarships, which Farmer advocated strongly from his earlier experience of the success which had attended the introduction by the Corporation a few years previously of a similar method for recruiting its staff. This important change, by revolutionizing the standard and qualifications of the Colonial Agricultural Officer, has proved of incalculable benefit to all tropical crops and to the industries connected with them.

Farmer was a gifted man and a remarkable personality. In pure science his accomplishments were high, for he was a distinguished cytologist and a Fellow of the Royal Society, and its Croonian Lecturer in 1907. In other spheres, however, there are many who acknowledge the help they received when they sought Farmer's advice on their problems; his knowledge of men and wide experience of affairs, his vitality and alertness of mind, and his all-embracing outlook made him the wisest of counsellors and a much valued friend.—V. H. B.

Many years ago the writer recorded his obligation to Sir John Farmer as "the director of a course of biological training in which information is held subordinate to essential principles." The phrase may perhaps stand as the briefest possible description of his great contribution to professional education. A common method of teaching botany in those days was for the student to read a detailed description of what he was to see and then proceed to look for it in the specimens provided. Farmer's method was the reverse of this. Only when he had found out

what he could for himself, aided when necessary by judicious suggestion, was the student encouraged to refer to recorded information. When he took up a Colonial post, as so many of Farmer's students did, the rightness of this method was soon revealed, for he had to deal for the most part with problems on which no specific information existed.

Not only did Farmer train men fittingly as working botanists, he took a great part in fitting them with suitable posts when trained, and he had probably no greater gratification than that which he derived from keeping in touch with the many who justified his endeavours.—W. N.

ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

1. India's Cotton Industry. (*Cotton*, M/c, 2/10/43.) India's cotton crop is the second largest of any country in the world, the average area under cotton being about 25 million acres, and the average crop about 2,400 million pounds in weight. Twenty-five years ago Indian mills consumed approximately one-third of the Indian cotton crop, now consumption is over three-fifths. There are 400 cotton mills in the country with a paid-up capital of 500 million rupees. The annual output of the mills is about 4,500 million yards of cloth, and sufficient surplus yarn for the handloom industry to produce a further 1,500 million yards of cloth per annum, thus giving employment to many millions of villagers. The organized cotton-mill industry of India gives direct and regular employment to well over half a million workers.

2. Recent Advances in Indian Cotton Production. By D. N. Mahta. (*Text. Mnfr.*, December, 1943, p. 546.) In this paper the author discusses the improvement in the character and staple of the Indian cotton crop brought about in recent years by the expansion of the area under superior varieties of cotton. The war has had the effect of accelerating this expansion, since the Continental and Far Eastern markets for the short staple cottons are closed. Further improvement in cotton yield has been brought about by the use of better seed, better cultivation and manuring practice, and judicious rotation of crops. To demonstrate to the cultivator the advantages of improved methods, the Indian Central Cotton Committee has financed several schemes to be carried out on cultivators' holdings in the various cotton-growing tracts. Legislation has also been enacted to prevent the influx of inferior cotton and cotton seed into areas growing superior varieties, and also to prevent malpractices at ginneries. Existing conditions are most favourable for the increased production of long-staple cottons over 1 inch, in view of the difficulty of obtaining foreign cotton for spinning finer counts of yarn.

3. Supply and Distribution of the Various Types of Indian Cotton during the Season 1941-42. (*Stat. Bull. No.* 12. Ind. Cent. Cott. Comm., 1943. Price 12 annas.) Gives statistical and other information concerning: area under approved varieties of cotton from 1939-40 to 1941-42; supply and distribution of various types of Indian cotton during the twelve months commencing September 1, 1941, and 1942; the Indian cotton crop of 1941-42 classified according to staple length; stocks of Indian cotton held on January 31, 1943, by the mills and the trade in Madras Province; exports, etc. Various appendices deal with Bombay average prices for Broach, Oomras, and Bengals 1927-28 to 1941-42; Indian cotton crop classified according to staple length, 1927-28 to 1941-42; stocks of Indian raw cotton held by the mills and the trade in India, 1938 to 1942; receipts at mills in India of raw cotton classified by varieties, 1932-33 to 1941-42; Indian raw cotton consumed in Indian mills, 1932-33 to 1941-42; exports of Indian cotton, and prices, 1927-28 to 1941-42.

4. Report on the Staple Length of the Indian Cotton Crop of the 1942-43 Season. (*Stat. Leaflt. No.* 1, 1943. Ind. Cent. Cott. Comm.) The crop of 1942-43 is estimated by the Government to produce in bales of 400 lb.:

Long staple, over 1 inch	270,000
Medium staple, $\frac{7}{8}$ to 1 inch	2,465,000
Short staple, below $\frac{7}{8}$ inch	1,819,000
Grand total	4,554,000

5. Indian Cotton Mills: Geographical Distribution. By S. Ganapati Rao. (*Ind. Text. J.*, **53**, 1943, p. 272. From *Summ. Curr. Lit.*, xxiii., **20**, 1943, p. 544.) The writer gives figures to show the changes in geographical distribution of cotton mills in India between 1921 and 1937. Thus, the figures for the Bombay Province are 183 out of a total of 281 mills in 1921 (65·0 per cent.), and 206 out of 423 mills in

1937 (48·7 per cent.); 69·6 per cent. of the total number of operatives in 1921, but 53·1 per cent. in 1937; and 71 per cent. of the yarn and 84 per cent. of the piece goods produced in 1921-22 as against 51 and 67 per cent. respectively in 1937. Some reasons for these changes are given.

6. Industrial Research. Organization in India. By Sir Ardeshir Dalal. (*Ind. Text. J.*, **53**, 1943, p. 130. From *J. Text. Inst.*, August, 1943, A428.) A report of an address on the organization of research into the natural products and manufactures of India, with special reference to the establishment in 1940 of the Board of Scientific and Industrial Research under the direction of Sir S. S. Bhatnagar, D.Sc. The results of research will be exploited by a Research Utilization Committee. Some research problems are mentioned, including the production of "a cotton cloth which has the warmth of wool."

7. Indian Handloom Weaving Industry: Protection. By (1) A handloom weaver. (2) By V. L. Mehta. (3) By K. S. Venkatraman. (*Ind. Text. J.*, **53**, 1943, p. 187. From *Summ. Curr. Lit.*, xxiii., 16/17, 1943, p. 463.) Three opinions are reported on K. S. Rao's suggestion that Indian mills should largely content themselves with spinning yarn for the handloom weaving industry and performing the finishing and marketing operations. (1) The writer denies that the costs of production in the handloom industry are so favourable as Rao maintained. (2) Mehta calls attention to the weak position of handloom weavers who have to contend with rising costs of yarn; since September, 1939, the cost of Indian mill yarn has increased far more steeply than the cost of the raw cotton. He advocates the use of hand-spun yarn by the handloom weavers rather than attempting to establish concord with the mill spinners. (3) Venkatraman calls attention to the serious plight of the handloom industry and calls for Government action to demarcate respective fields of production for the hand and power sections.

[*Cf.* Abstr. 12, Vol. XX. of this Review.]

8. Indian Cotton Textile Industry: Control. (*Ind. Text. J.*, **53**. 1943, pp. 274, 317. From *Summ. Curr. Lit.*, xxiii., **20**, 1943, p. 544.) An outline is given of a scheme for the control of maximum prices. Negotiations began on June 1, 1943, over a statement by the Secretary of the Industries and Civil Supplies Department of the Government of India. The panel of mill owners accepted the proposals after discussion, and agreed to produce 1,000 million yards of standard cloth before the end of January, 1944. Criticisms at the conference and subsequently are reviewed. One point raised was that the proposed control price for raw cotton, 550 rupees per candy (1s. 8d. per lb.!) for Jarila as basis, does not offer a fair return to the grower although three times the pre-war price.

9. Indian Cotton Piece Goods and Yarn: Marketing. By S. C. Pathak. (*Ind. Text. J.*, **53**, 1943, p. 325. From *Summ. Curr. Lit.*, xxiii., **20**, 1943, p. 544.) The writer makes a strong plea for better organization of cloth and yarn marketing in India. Total imports of piece goods in 1942-43 were only 15 million yards, whereas in 1913-14 the United Kingdom alone sent 3,104 million yards to India. Indian production in 1942-43 is estimated at 4,500 million yards by the mills and 1,200 million yards by the handloom industry. The *per capita* consumption of cloth in India was 16·5 yards in 1913-14 and about 15·5 yards in 1941-42. In spite of the stationary domestic demand, there is at present an annual shortage of cloth of about 2,100 million yards. Prices have risen to roughly five times those ruling in August, 1939. There is an ample supply of Indian cotton and the writer suggests means for increasing yarn and cloth production. Tables are given to show the profits made by Indian firms.

10. Indian Cotton Warps: Quality. By J. H. Strong. (*Ind. Text. J.*, **53**, 1943, p. 145. From *Summ. Curr. Lit.*, xxiii., **13**, 1943, p. 341.) The author discusses the question of the qualities in warp yarns that "the weaving section has a right to expect." He suggests that the maximum number of ends or picks per inch that can be reasonably demanded in cloths woven from the better Indian cottons is given by the formula $14\sqrt{\text{count}}$, and he also gives a table of suitable lea strengths, ranging from 143·0 lb. in 6's to 76·0 lb. in 25's. The extensibility of the yarn should be at

least 4 per cent. Questions of excessive twist and breaks in warp preparation are discussed.

11. INDIAN SOURCES OF ECONOMIC INFORMATION. (*Ind. Text. J.*, **53**, 1943, p. 222. From *Summ. Curr. Lit.*, xxiii., 16/17, 1943, p. 463.) Notes are given on the various Indian publications that give statistics of cotton production and utilization, and other agricultural information.

12. INDIAN CENTRAL COTTON COMMITTEE. (*Ann. Rpt.*, 1941-42, received 1943.) Despite war conditions, good progress was made in research and other useful activities. Thirty-one research and eighteen seed extension schemes financed by the Committee were in operation. The various Acts passed for the regulation of transport, marketing, ginning and pressing of cotton, and the prevention of the introduction of foreign pests continued to function satisfactorily. Investigations in connection with the following pests and diseases were also carried out: spotted bollworm, black-headed cricket, jassid, stem weevil, and the root-rot and wilt diseases. Good progress was made with the work of the Indore Institute of Plant Industry in connection with cotton genetics, physiology, selection, and breeding, and seed multiplication and extension. At the Technological Research Laboratory, Matunga, Bombay, the total number of samples tested was 2,100 compared with 1,800 in the previous season, and 1,208 reports on them were issued. In addition, a number of technological investigations were in progress connected with the pre-cleaning and ginning of Indian seed cottons on different machines and with different speeds and settings, the effect of different speeds of beater and fan in the Crighton opener, the effect of employing different weights, speeds and roller settings in the draw-frame, and the prediction of spinning value from fibre properties of Indian cottons, etc.

13. INDIAN CENTRAL COTTON COMMITTEE: REPORT OF THE TECHNOLOGICAL LABORATORY, 1942-43. (Ind. Cent. Cott. Comm., 1943. Price 6 annas.) The total of 1,129 samples received for test during the season was less than that of the previous year owing to the termination of the arrangement for testing the large numbers of samples for the Indian Stores Department who now have their own arrangements for carrying out this work in Bombay. Increasing use of the spinning test facilities of the Laboratory was made not only by Indian mills and firms, but also by agencies in Belgian Congo and East Africa. The Spinning Laboratory, Technological Research, Fibre Testing and Ginning Sections were all occupied throughout the year with cotton investigations, and brief accounts are given of the results of the work. Two technological bulletins by Dr. Nazir Ahmad and 36 technological circulars were published during the period under review.

14. SPINNING TEST REPORTS ON INDIAN COTTONS, 1942-43. By N. Ahmad. (*Tech. Circs.*, Nos. 539-541, 544-552, 554-559, 561-566. Ind. Cent. Cott. Comm.) The circulars contain the report of the Standards Committee and spinning test results for Punjab-American 4F, LSS, Jarila, Verum, Berar, Punjab-American 289F/43, Broach, Navsari, and Upland cottons; the grader's report and spinning test results for Farm Westerns, Hubli Jayawant, Broach, Gadag Upland, Westerns, Surat, Jagadia, Bawla, Kadi, Cambodia, Karunganni, and Tinnevelly cottons; the report of the Special Appeal Committee for African cottons and spinning test results for A. R. Kampala and A. R. Jinja cottons.

15. TECHNOLOGICAL REPORTS ON INDIAN COTTONS, 1942-43. By N. Ahmad. (*Tech. Circs.*, Nos. 538, 542-3, 553, 560, 567-8. Ind. Cent. Cott. Comm.) The particulars given include agricultural details, grader's report, fibre particulars, spinning test results, remarks and conclusions.

Jarila.—Yarns somewhat neppy. An appreciable decline in spinning performance in the past two seasons. Suitable for 25's warp.

*V.*434 (*Akola*).—Yarns show an improvement in regard to neppiness. Suitable for 23's warp.

Sind Sudhar (289*F*-1). (*Saw-ginned.*) Yarns slightly neppy. Suitable for 47's warp.

Sind Sudhar (289*F*-1). (*Roller-ginned.*) Yarns generally neppy, and in previous season very neppy. Suitable for 47's warp.

Umri.Bani.—Yarns more neppy than in previous four seasons. Yarn-strength results show an improvement since 1928-29. Suitable for 28's warp.

Surat 1027 *ALF.*—Spinning performance shows an improvement over the previous season. Suitable for 32's warp.

Punjab-American 4F.—Yarns somewhat neppy. Yarn strength continues to show improvement. Suitable ror 27's warp.

16. Bengal: Indian Cotton: Cultivation in the Chittagong Hill Tracts. By M. P. Singh. (*Ind. Text. J.*, **53**, p. 144. From *Summ. Curr. Lit.*, xxiii., **13**, 1943, p. 338.) The Chittagong Hill Tracts are a primary or secondary centre of distribution of the cottons found in the Ganges basin and Central India, and may have given rise even to some of the coarse cottons of China. About 90,000 acres of the hill slopes are under cotton, and the exports reached nearly 3,000 tons in 1934-35. A survey of the tracts was made in 1937. The bulk of the crop came within the range 15-21 mm. in staple length, with an average of 17 mm. Some varieties have brown lint. The outstanding feature, however, is the high ginning percentage, ranging from 23 to 57, with a maximum frequency at 44. It is recommended that the cottons should be developed for mixing with wool.

17. Bombay: Surat 1027 ALF Cotton: Variation in Fibre Characters. By - Srinagabhushana. (*Ind. Text. J.*, **53**, 1942, p. 76. From *Summ. Curr. Lit.*, xxiii., **9**, 1943, p. 253.) A random selection of 100 plants was made from an area sown with pure seed of Surat 1027. The produce of each plant was picked separately, taking one short pick of only the bolls that ripened during a particular week. The 100 samples were examined for ginning percentage, lint index, and seed weight. From the results, the characteristics of the distribution of these three properties among the samples were calculated, and are given in a table. The relevant frequency polygons are also given and discussed. From among these 100 plants a selection of 30 plants was so made that the ranges of variation among them, for all the three characteristics already studied, taken two by two, were limited to a small region round their nuclear values. These samples were tested for length (Balls sorter), weight, and maturity. The results are tabulated. They show that among individual plants of the same pure strain 1027 ALF, even when specially selected for small ranges of variation in three characteristics, the other fibre particulars may vary considerably. The fibre weight per inch varied from 161 to 204 units, from a fine to a relatively coarse cotton which, as the standard hair weight suggests, may not be all environmental effect. The length characteristic showed a range of 0·08 inch. An inspection of the individual values has shown a combination of staple length of 1·05 inches, with a fibre weight of 181 units and as high a ginning as 38 per cent., with good maturity. These results seem to suggest that a sustained effort in search of a suitable off-type from the strain itself might be adequately rewarded.

18. Hyderabad: Improvement of Warangal Cotton. By M. M. Baid. (*Ind. Frmg.*, April, 1943, p. 215.) The survey of the crop in the Dominions, carried out with the financial aid of the Indian Central Cotton Committee, has shown that the crop grown in Warangal, Karimnagar, Adilabad and Nalgonda is a mixture of several types, and much is short staple. It does not meet the requirement of the textile mill in Warangal or ensure a satisfactory price to the grower. With a view to improving the cotton in the Warangal district, and to studying the possibilities of growing cotton on granitic soil, the Agricultural Department submitted a five years' scheme to the Government. The Azamjahi Mills, Warangal, cannot obtain supplies of the necessary cotton locally or in adjoining districts, and have to incur considerable expense in importing it from Nanded, and other places. The owners realized the benefit that would accrue to them from the proposed scheme, and offered to co-operate with the Government in the work of cotton improvement in Warangal. They agreed to meet the whole of the non-recurring expenditure of Rs. 11,075 required for the construction of a laboratory, and half of the recurring expenditure of Rs. 5,562 annually towards the cost of establishment and cultivation charges. Work has been initiated at the Government Farm, Warangal, in connection with the scheme.

19. MADRAS: COTTON INDUSTRY, 1940-41. (*Ann. Rpt. Operns. of Dpt. Agr. Madras*, 1940-41, received 1944.) The heavy rains of October and November, 1940, adversely affected the cotton crop in most areas, and cotton pests and diseases were more in evidence. A special feature of the year was the release of two strains of cotton of much economic value for distribution in the various districts. They were crosses between Co.2 and U.4, originally named X3915 and X4383, but since renamed Co.3 and Co.4 respectively. Their chief merit lies in the superior quality of the lint, which spins up to 50's as against 36's for Co.2. The strains have become very popular with cultivators.

The various Acts passed for the regulation of the cotton industry continued to function satisfactorily in the province throughout the year.

20. COTTON CULTIVATION, 1940-41. (Ann. Reports of various Stations, 1940-41, received 1944.) At Coimbatore unfavourable weather conditions adversely affected the germination of the cotton crop, and it was also attacked by leaf rollers, gram caterpillar, and wilt disease. As in previous years, investigations were mainly concerned with the improvement of Cambodia and Salem varieties. At Hagari Station the yield of H.1 averaged only 50 per cent. of normal, due to a severe attack of wilt disease which affected the stand and growth of the cotton. Work on the improvement of Westerns cotton was continued. At Koilpatti Station the unusually heavy rainfall at the growing period was unfavourable for all crops, and in addition cotton suffered appreciable damage from ground weevil and wilt disease. With the dry weather in December conditions improved and crop yields increased. In yield trials a new selection, 4706, proved superior to the control K-1. The north-eastern monsoon was favourable to cotton at the Nandyal Station. In yield trials the strain 556 gave uniformly higher yields than Local in all districts.

21. SIND: KARACHI FUTURES MARKET. (*Cotton*, M/c, 12/2/44.) The Government of India has permitted the reopening of Futures trading in cotton in the ring of the Karachi Cotton Association, subject to the safeguards laid down for the reopening of the Futures market of the East India Cotton Association. Trading will be permissible only in fine MG 4F hedge contract, subject to a ceiling of Rs. 61 and a floor of Rs. 46 per maund for the 1943-44 crop.

22. UNITED PROVINCES: COTTON RESEARCH, 1941-42. (*Ann. Admin. Rpt. of Dpt. Agr.*, 1941-42. Received 1943.) During the season under review the survey strain "D" and C520/2 gave promising results. Work on the improvement of *desi* cottons aimed at evolving a variety by hybridization that would spin from 20 to 25 counts in the rain-fed tracts. The hybridization of C520 and C402 with superior cottons such as Bani, Gaorani Shan and Million Dollar was continued. The Punjab-Americans outyielded the Perso-American during the year under report. A scheme, financed mainly by the Indian Central Cotton Committee, was started in the western districts of the Province to replace short-staple cottons by Perso-American in areas where irrigation facilities are available.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

23. COLONIAL RESEARCH COMMITTEE: PROGRESS REPORT, 1942-43. (Cmd. 6486. Pubd. by H.M. Stat. Off., 1943. Price 6d. net.) The Colonial Research Committee, of which Lord Hailey is Chairman, was appointed in June, 1942, "to advise on the expenditure of the £500,000 a year provided by the Colonial Government and Welfare Act, 1940, for the promotion of research and enquiry in matters affecting the Colonies and to advise upon and co-ordinate the whole range of research in the Colonies, irrespective of the provenance of funds." The first progress report was issued in November, 1943, but the Committee proposes in future to present an annual report in April—*i.e.*, at the end of the financial year.

The history and functions of the Committee are summarized, and it is pointed out that although considerable sums were spent on colonial research by the Colonial Development Acts and by the Empire Marketing Board, the money voted under the Colonial Development and Welfare Act of 1940 was the first provision for colonial

research made by Parliament on any comprehensive scale. In a discussion of the first year's work the Committee has confined itself mainly to the preliminary task of surveying the special problems and needs of colonial research as a whole, and to an examination of the general principles which should be followed in its organization. The results of the investigations, not yet completed, are then summarized, and afford some estimate of the character of the research work already undertaken in the colonial territories. Much of the work has so far been carried out under Government auspices, and in many instances has been both initiated and financed by Colonial Governments. Unofficial and commercial undertakings have also financed a considerable amount of research in the Colonies. The Empire Cotton Growing Corporation has stations in the West Indies, South and East Africa, and is planning the development of a large research institute and laboratory in Uganda. The Rubber Research Institute in Malaya, and the Tea, Rubber, and Cocoa Research Institutes of Ceylon have all contributed much to the prosperity of the Colonies. In addition, many important research projects have been financed by different Foundations, Trusts, Research Councils and other bodies. Apart from the work done in the Colonies themselves important investigations have been carried out in the laboratories or research institutes in the United Kingdom and through international organizations.

The special problems of colonial research are then discussed under the headings: the need for an extended range of research; continuity of research; research affected by shortage of technical staff; isolation and restricted opportunities for colonial research workers; the need for central and regional organization of research; the question of Government control in relation to colonial research.

The subjects which the Committee has so far reviewed include topographical and geodetic surveys, magnetic and meteorological services, agriculture (including soil science, botany, plant pathology, etc.), forestry, fisheries, animal health, and some of the social sciences, and the conclusions reached after discussion with experts in each sphere are summarized.

Particulars are given of research schemes already approved under the Colonial Development and Welfare Act. It is intended that there should be the greatest possible elasticity in the arrangement for submitting schemes to the Committee. Probably the bulk will come from Colonial Governments themselves, but the Secretary of State will also submit projects recommended to him by his various Advisory Committees. The Committee is not an executive body, but it may initiate research schemes by inviting research organizations to undertake them or by recommending the appointment of special persons to take charge of the work. The Committee also hopes to be able to consider applications for grants from individual workers. It considers it an important part of its duties to encourage pure as well as applied research in the Colonies, and to give young scientists an opportunity of acquiring first-hand knowledge of the environmental and social problems of the colonial territories by carrying out research projects along the lines of their own interests in these territories. It has, therefore, recommended the establishment of Colonial Research Fellowships so as to build up a cadre of young men and women familiar with colonial scientific problems and able to help in their solution. It may also be of value to finance occasional pieces of research by senior scientists holding academic or other research posts.

In regard to the international and imperial aspects of colonial research, the Committee feels that it should take every opportunity of establishing contact with interested individuals and organizations in other countries, more particularly perhaps with those within the British Empire. Research in Australia, South Africa, and Canada may be of vital interest to British Colonies, and permanent contact has been established with those scientific liaison officers of the Dominions who have been appointed in London. Close contact already exists between the scientists of the United Kingdom and those of the United States, and the Committee is of opinion that collaboration with the scientists of foreign powers is of equal importance for many parts of the Colonial Empire as are the links between the different colonies themselves.

Four Appendices are included with the Report: I. First Interim Report of the

Colonial Products Research Council. II. Research schemes approved under the Colonial Development and Welfare Act, 1940. III. List of Colonial Agricultural and Medical Research Institutes. IV. Centres for the collection, distribution, and interchange of scientific information on Agriculture and Medicine.

24. A Review of the Work of the Experiment Stations, Seasons 1939-40 to 1941-42. By W. Nowell. (Pubd. by the Empire Cotton Growing Corpn., 1943. Price 2s. post free.) A year is a relatively short time in the course of crop improvement by selection and experiment. A single season's work cannot at best carry one very far, and is all too frequently reduced in value by accidents of weather or the prevalence of pests. To these hindrances are now added the dispersal of staffs and the urgent diversions entailed by a state of war. In these circumstances it was decided that the customary annual review of the progress reports from the cotton experiment stations should be suspended and a triennial review be issued in its place. It is the purpose of this review to supply to its readers—whose interest in the problems of cotton production in the Empire is assumed, but who may be unable or disinclined to study some 200 pages per annum of technical reports—brief and easily readable summaries of the work in connection with agricultural practice, plant breeding, and control of pests and diseases carried out at the various experiment stations in which the Corporation has a direct or indirect interest, and of the progress made in the relevant period.

25. Cotton: A Lancashire Contribution to the Empire. By Sir William Himbury. (*Crown Col.*, February, 1944, p. 93.) The drastic shortages in American cotton supplies from time to time brought about the establishment, first, of the British Cotton Growing Association, and, later, of the Empire Cotton Growing Corporation, with the object of finding new sources of supply within the British Empire, and an interesting account is given of the introduction and fostering of cotton cultivation in the Sudan, Uganda, Tanganyika, Nyasaland, Nigeria, and the West Indies. As a result of the work carried out in these new fields of Empire some 800,000 to 900,000 bales of excellent cotton have been added to the world's annual supply, a quantity which will increase. Cotton growing in countries other than America and Egypt will also be some insurance to the spinners should serious adverse climatic conditions and injury from insect pests affect one or other of the older sources of supply. From a money point of view it has added a further £10,000,000 to £15,000,000 annually to the spending power of colonial peoples. The grower has been shown how to produce a cash crop on his own land, working in his own time, and without leaving his village to seek employment. Cotton seed has been distributed to him, and Government Agricultural Officers are in constant touch to help him in every possible way. Not being disturbed in his village life, he spends money on improving his conditions of housing and living. The Government naturally benefits from the contentment of the people, and the extra revenue received from Customs duties on the larger amount of imported goods consumed. The Lancashire cotton industry has also gained from so much more cotton being added to the world's stocks, and the fact of not being entirely dependent on the Western Hemisphere. All the cotton grown has been sold in the open market, and to all countries, these countries purchasing at exactly the same prices as those paid by British spinners. Sir William states emphatically that "Lancashire's effort has had a tremendous influence on the enlightenment and civilization of the African. Railways, roads and harbours cannot be made without money, and low-priced commodities produced a long distance from the sea coast cannot pay high charges. Cotton, on the other hand, is a valuable crop worth about £60 a ton in Uganda, and £75 in the Sudan, and has been able to stand the fairly high cost of freight by rail and sea. Again, would the many millions have been spent on a barrage in the Sudan but for cotton, the growing of which has settled some few millions of people who were formerly occupied in warfare, raiding their weaker brethren, and stealing their camels, cattle, and women?"

26. EUROPE. Malta: Cotton Cultivation, 1943. A recent report from the Dept. of Agriculture states that cotton was grown on only 24 acres, and the crop was used for local manufactures.

27. ASIA. CYPRUS: COTTON INDUSTRY, 1942. A note from the Dept. of Agriculture, received in October last, stated that although there was an increase in the area planted to cotton in 1942 over that of 1941, both area and yield were lower than in 1940, owing to the preference given to food crops. Production in 1942 was 1,589 bales of 400 lb. compared with 722 in 1941 and 1,735 bales in 1940. The extension of the cultivation of the American variety Coker 100 increased again during the year, and the quality of Cyprus cotton lint was generally improved thereby.

28. AFRICA. NYASALAND: COTTON INDUSTRY, 1941-42. (*Ann. Rpt. Dpt. Agr.*, 1942, received 1943.) The cotton crop was the largest since 1938, this being due to satisfactory prices obtained during the previous season resulting in a marked increase in the number of growers, favourable weather conditions during the growing season, and little damage from pests and diseases. Mr. H. C. Ducker, the Cotton Specialist, states that at the Nkwale Experiment Station work on general agricultural problems connected with cotton has made good progress, particularly that connected with "rest cropping" for the restoration of soil fertility, and the relationship between cotton and the main rotational food crops. A minimum rest period of three years is recommended in a cropping cycle of eight years. Work with the "920" strain of U.4 cotton has been carried to the large-scale commercial stage in the S.W. Lake shore area, 100 tons of seed being available for distribution the following season; it is not considered, however, that this cotton will be suitable for the Lower River areas. On the Domira Bay Station straight U.4 types are taking second place to superior cotton selected from the Crown Land commercial U.4 mixtures, and to certain East African Upland types. One of the latter, Mz.561, is outstanding in its combination of good agricultural and lint characters. It has proved suitable for a wide range of conditions in the Central and Lower River cotton areas.

29. COTTON PESTS. (*E. Afr. and Rhod.*, 13/1/44, p. 417.) In his speech at the opening of the 59th session of the Legislative Council, the Governor, Sir Edmund Richards, said: "The ravages of bollworm have for many years constituted a threat to our cotton industry, especially in the Lower Shire areas, and have caused much anxiety to all concerned. I am glad, therefore, to state that the entomological staff of the Empire Cotton Growing Corporation are able to report that, as a result of intensive investigation and research during the last four years, they have now an accurate appreciation of the causes of the severe fluctuations and heavy losses often suffered by the Lower River crop, and a full understanding of the scientific problems involved. They have thus reached a position where they can apply such knowledge to the formulation of measures directed against the insect pests concerned. I am told that it is possible to see, not one clear-cut and obvious line of attack, but several widely divergent courses, all of them having their merits and some defects. Proposals will be fully ventilated in 1944 in time to put them into effect for the 1944-45 cotton season."

30. NORTHERN RHODESIA: COTTON CULTIVATION. (*Ann. Rpt. Dpt. Agr.*, 1941-42. Received 1943.) The native has little difficulty in these days in selling everything he can produce surplus to his own requirements, but long before this temporary improvement in economic status occurred as a result of the war, the Dept. of Agriculture was endeavouring to build up cotton and tobacco growing industries to provide much needed cash crops in the Eastern Province. While the primary *raison d'être* has, for the time being, been removed, these projects have been continued for the sake of the indirect benefits received, and to provide a possible basis for the improvement of post-war economic conditions in suitable areas. The Native Development Board finances the purchase, handling, and transport of the crops and receives the revenue from sales. Cotton production is confined to the Marambo area of the Luangwa Valley and has not the same possibilities of expansion as tobacco; in fact, it is unlikely to develop to true commercial proportions. Nevertheless it is unquestionably of benefit, both directly and indirectly, to the small, poor Akole tribe among whom a suggestion that cotton growing should be discontinued met with unexpectedly strong opposition. The 1941-42 season was a good one and the average yield of seed cotton estimated at between 600-700 lb. per acre. 365 growers produced a total of 91,000 lb.

of seed cotton which was purchased at ¾d. per lb. Lint, in the quantities at present produced, finds a ready market within the territory among Europeans and Africans for domestic purposes, and is also used as a cleaning material in the mines.

31. Cotton Industry, 1942-44. A recent report from the Dept. of Agriculture states that there was a reduction in production in the 1942-43 season due to adverse weather conditions, the absence of men from the villages, and to lack of supervision owing to the necessity of concentrating both European and African staff on other work. In the current season there was an increase in the number of growers, but the rains were late, and planting had not been completed by the end of December, much re-planting being necessary.

32. Southern Rhodesia: Cotton Industry, 1942-43. From the report of Major G. S. Cameron we learn that the acreage planted to cotton showed an increase over the previous season, but weather conditions were unfavourable, and as a consequence yields, with few exceptions, were very disappointing. In regard to European production, 5,457 acres were harvested and yielded 1,675,428 lb. seed cotton. Ginning operations lasted from June 30 to October 13. The amount of good sound seed obtained was very small this year as a consequence of the unfavourable season, but there was sufficient seed 60 per cent. and over in soundness to meet the demand for "machine delinted" (fuzzy) seed. Of the new strain 9L18 all the seed, except for a proportion too poor in quality, was acid-delinted, and some 56,000 lb. were available for planting. The balance of the seed for planting was supplied from strain 7L1, which it is proposed to withdraw next season. The quality of the season's crop was disappointing. Payment to growers was effected at the guaranteed prices under the Government Cotton Price Stabilization Scheme, but due to the lower average quality of the crop, prices compared unfavourably with those of the previous season. The total net distribution amounted to £17,216 16s., equal to 7·32d. per lb. lint.

Prospects for 1943-44 season. Good planting rains have been general throughout Mashonaland, but the western part of the Colony, Matabeleland, has again experienced droughty conditions. Although maize prices are very tempting, there is a shortage of fertilizer, and this may account for an increase in the acreage planted to cotton, which does not require artificial fertilizer. Up to the end of January growing conditions have been ideal, and a number of farmers have reported that their cotton crops look very promising, although they realize that it is too early in the season to predict damage from bollworms and stainers.

33. Plant Protection Act, 1942. (Salisbury, S. Rhodesia, 1943. From *Rev. App. Ent.*, xxxi., Ser. A, **9**, 1943, p. 359.) Under the Plant Protection Act of 1942 (which was brought into force by Proclamation on April 9, 1943) the Governor may make regulations for the eradication or control of pests or the prevention of their spread and for the prohibition, restriction and regulation of the importation of plants and the soil, wrappings, etc., accompanying them. The term pest includes any stage of any invertebrate animal or vegetable organism injurious to plants or plant products, any communicable disease of plants, and any agent capable of producing such a disease. By Government Notice No. 186 of April 9, 1943, cited as the Cotton Pest Prevention Regulations, 1943, *Diparopsis castanea*, Hmps., *Dysdercus* spp., and *Empoasca facialis*, Jac., are declared to be pests, and all landowners are required, except in exempted areas, to destroy by October 1 each year all cultivated plants of the genus *Gossypium* on their land.

34. Local Manufacture of Absorbent Cotton Wool. By G. S. Cameron. (*Rhod. Agr. Jour.*, July-August, 1943, p. 215.) The manufacture of absorbent cotton wool is a new and promising industry in Southern Rhodesia, and in this short paper Major Cameron deals with the three processes of manufacture: opening and cleaning, wet processing, and finishing. Several illustrations are included. It is very satisfactory to record that an excellent reception has been given to this new Rhodesian product not only in the country itself but also in South Africa and other neighbouring territories.

35. South Africa: Cotton Industry, 1942-44. A report recently received states that in 1942-43 planting conditions were most unfavourable, and the abnormal rains

that prevailed throughout the season prevented many growers from picking the crop, especially in the Eastern Transvaal. Prospects for the 1943-44 crop at the time of writing (January) were not promising, owing also to excessive rainfall.

36. BARBERTON EXPERIMENT STATION: PROSPECTS FOR 1943-44. A note from Mr. Parnell is to the effect that cotton was planted early and got away well. A dry December did it little harm, and since then a month of good rains, with continued high temperatures, has put it into excellent order. There has been practically no American bollworm so far and flowering is heavy; thus prospects for a satisfactory season's work are very good.

37. SWAZILAND: EXPERIMENT STATIONS: PROSPECTS FOR 1943-44. A note received from Mr. Lochrie states that at Bremersdorp the cotton crop was planted early under good conditions. Rainfall continued satisfactory and the prospects at the Station are the best for some years. Bollworm infestation has so far been negligible. At Croydon also the crop was planted and established in good conditions. The rainfall, though considerably less than at Bremersdorp, has been sufficient to maintain the crop. Flowering and bolling are excellent, and with bollworm negligible the prospects are good. There is some angular leafspot, but at neither Station has bacterial disease caused damage.

38. SUDAN: SURVEY OF THE ANGLO-EGYPTIAN SUDAN, 1898-1941. By K. D. D. Henderson. (The Abbey Press, Ltd., Westminster, London, S.W.1, 1943.) The Sudan Government had all the advantages and disadvantages of starting from zero. The thirteen years' rule of the Khalifa Abdullahi, a period usually called the Mahdia after the Khalifa's master and predecessor, Mohammed Ahmed el-Mahdi, had effectually obliterated all traces of the previous Turkish and Fung administrative systems. It had practically destroyed tribal unities and loyalties, and battle, famine, and pestilence had reduced the population of the Sudan from about eight millions to less than three. Some idea of the country's recovery can be gained from the official estimate of just over six millions forty years later—no small testimony to the success of the early efforts. Of these, perhaps the most remarkable was the establishment of public security. Tribal fights, camel theft, kidnapping and robbery with violence will continue for some years in a country where most men are armed with knife or spear, but the incidence of such offences is infinitesimal when compared with that of the Mahdia, when the shortest journey was a perilous adventure and no woman was safe outside her own door. A major element in the achievement of this success was the ready accessibility of the administrative and judicial staff and the rapid execution of justice. Moreover, the national characteristics of the Sudanese have lent themselves to the creation of a police force which has combined the qualities of loyalty, courage, and individual initiative with civility and benevolence to the general public. The Sudanese policeman is a very fair copy of his London brother, and his shortcomings as regards literacy and ability to deal with modern organized crime are being made good in time to meet the new problems as they arise. Assured of his personal security and that of his property, the ordinary man's next requirement is an opportunity to acquire sufficient worldly goods to enable him to live in reasonable comfort. For the people of the Sudan this means grain to eat and stock for capital, and to these ends the Departments of Agriculture and Veterinary Science have devoted their energies. Quick-maturing and pest-resistant types of grain have been developed and introduced, and the setting up of a Locust Control organization has saved the country thousands of pounds. There has been a revival in mixed farming stimulated by the introduction of scientific methods of soil improvement, such as the Indore compost pit, and of feeding for working animals, together with seed-saving clubs and other co-operative organizations. The Public Works Department has been engaged on the sinking of deep-bore wells, and this has contributed, especially in the Western Sudan, to the conversion of nomads to agriculture, to the development of the cattle export trade, and to the expansion of the gum-picking industry. A notable feature of recent years has been the introduction by the Forestry Department of the American mesquite tree, which is a valuable anti-erosion agent in semi-desert conditions, and also provides highly nutritive fodder for cattle

and an edible flour for human consumption. The Department has also co-operated with the Medical Service in schemes for the improvement of native housing. The Veterinary Service has concentrated on the development of a regular export market for Sudan cattle and sheep by building up a reservoir of good quality stock. Once initial forebodings have been overcome, there is little difficulty in obtaining the stock-breeder's co-operation in the war against the two great cattle scourges, rinderpest and pleuro-pneumonia. Efforts have been made to establish the principles of selective stock-breeding without which the elimination of disease defeats its own ends. The Medical Services of the Sudan have steadily developed into a widespread and comprehensive organization. In 1940 over 100,000 in-patients were treated and there were 6,649,335 out-patient attendances. An efficient hospital and dispensary organization and an adequate public health system are in being, together with facilities for laboratory work and medical research. All these services cost money, and it was early apparent that the maximum development of existing resources could never produce enough revenue to allow of their expansion or of the enlistment of the necessary expert assistance from outside the country. The one considerable cash crop, gum, in itself could not produce the necessary balance of trade, and an alternative had to be found. The answer was clearly cotton, which was already being grown with success in the deltas of the Gash and Baraka rivers. This need and the lack of a guaranteed grain supply brought into being the Gezira Irrigation Scheme, for the launching of which the British Government guaranteed loans amounting to over 11½ millions sterling. In the organization of this project the rights of the native landowner and cultivator were carefully safeguarded, while the experience and skill of the Sudan Plantations Syndicate were placed at his disposal for growing and marketing the crop. At the same time the Government was provided with sufficient revenue, so long as cotton prices held, to pay off its loans, in addition to taking the necessary steps for further social and economic improvements. The first call on the Sudan's expanding revenues was made by the Education Department, and good progress has been achieved in the education of the Sudanese by means of elementary, intermediate, and technical schools. The great depression caused a severe curtailment of expenditure, but revenue was again available for the purpose in 1937, when the De La Warr Commission was invited to review the Sudan system. The Commission recommended a wide scheme of expansion and reorganization to be spread over ten years, involving a capital expenditure of nearly half a million pounds and an increase in recurrent expenses of £E150,000 a year. The standard of the Gordon College was to be brought up to that of the good English secondary schools, post-secondary courses were to be held which would develop as soon as possible into a college of university standing, the number of teachers in both boys' and girls' elementary schools was to be doubled, and the intermediate schools were to be similarly expanded and improved. The full implementation of this programme has been delayed, but not interrupted, by the war.

39. Tanganyika Territory: Cotton Industry, 1941-42. (*Ann. Rpt. Dpt. Agr.*, 1942. Received 1943.) Cotton exports amounted to 44,000 bales valued at £640,843 compared with 65,145 bales and £787,717 in the previous season. The actual production was 51,107 bales. During the year the price of cotton in Bombay, the sole market, rose very steeply, and growers during the last quarter received approximately 45 cents a kilo for seed cotton, the highest price recorded for many years. The marketing of the Lake Province crop, the price of which was based on the Kampala market for Bombay, functioned quietly with a steady bullish tendency, but when the season opened for the rest of the territorial cotton in August political conditions in Bombay were so unsettled that the Cotton Exchange was closed and no prices quoted. In the circumstances ginners were unwilling to purchase cotton from growers unless Government guaranteed them against loss, and at the time conditions were such that £2 a bale was considered necessary to cover the risk. This insurance, which was collected in the form of an export tax, proved unnecessary, as the demand for cotton in Bombay remained unabated. Later in the year His Majesty's Government intimated that it was prepared to purchase the whole East African cotton crop for a

minimum of three years, or for the duration of the war and for one year after, at a fixed price.

40. Cotton Industry, 1942-43. A report from the Dept. of Agriculture states that the acreage planted to cotton declined sharply in most producing areas owing to the adverse weather conditions and also to the urgent necessity for the maximum planting of foodstuffs. In the Lake Province growing conditions in the latter half of the season were favourable and good yields were obtained even from late plantings. Little damage was caused by pests and diseases, and the crop was unusually clean. In the Eastern Province yields were somewhat reduced by early cessation of the rains, and in some districts bollworm and stainers were more in evidence than usual. In the minor producing areas growing conditions were somewhat patchy, but yields on the whole were very fair.

41. Uganda: Cotton Industry, 1941-43. (*Ann. Rpt. Dpt. Agr.*, 1941-42. Received 1943.) A slightly larger acreage was planted to cotton in 1941-42, but bad weather conditions reduced the crop considerably. Unsatisfactory prices offered for Uganda cotton necessitated the suspension of buying in February for a month. The agreement by the Ministry of Supply to take nearly half the crop stimulated demand and hardened prices on the resumption of buying. The average price paid for seed cotton was Shs. 7/68 per 100 lb.

1942-43 *Crop.* At the end of June only 103,961 acres had been planted to cotton, compared with 371,989 acres for the same period in the previous season. This was primarily due to unfavourable weather conditions, but also to the fact that growers were dissatisfied with the previous year's prices, and showed more enthusiasm for crops such as groundnuts and simsim, for which there was a greatly increased demand as a result of the war.

42. Cotton Prospects, 1943-44. The report of the Dept. of Agriculture for December last stated that with the exception of Toro District, where rainfall was slightly above the average for the month, all other cotton areas received a minimum of rain, and typical dry season conditions prevailed, necessitating a further reduction in the estimate of the total crop. Picking was in progress in all areas, and grade was reported to be satisfactory. There was increased damage by cotton stainers in Buganda Province, but little damage was reported from the other two Provinces.

43. Cotton Price Committee. (*Crown Col.*, February, 1944, p. 136.) The Governor has appointed a Committee, under the chairmanship of the Director of Agriculture, to advise him in regard to the fixing of minimum prices to be paid for raw cotton, should it become necessary to fix prices during the 1943-44 season, and the fixing of maximum prices for ginning and baling.

44. Secondary Industries. (*E. Afr. and Rhod.*, 24/2/44, p. 535.) The Uganda Industrial Committee is engaged in examining and developing the Protectorate's potentialities for industrialization, largely with the object of utilizing local raw materials and saving shipping space. Workshops established in Entebbe are manned by skilled internees, who are training Africans in mechanical spinning and weaving (on machines ingeniously improvised by the internees from scrap) and in all kinds of mechanical repairs. Potteries are being built at the site of kaolin deposits near Entebbe, where Africans will be trained in both pottery and tile-making. The manufacture of rough paper, rope, string and gunny bags is under investigation. Hand spinning and weaving of wool and cotton are taught to Africans in a second workshop in Kampala. It is hoped that these arrangements will foster village industries, for which spinning wheels and looms are to be distributed to villagers at the lowest possible cost.

45. Breeding Experiments, 1941-42. (*Ann. Rpt. Dpt. Agr.*, 1941-42.) Work at Kawanda was mainly concerned with the task of evolving better strains of cotton than the existing variety B.P.52. In addition, hybridization work was carried out with a large number of varieties in order to introduce new genes into the material. The fuzzy seed character was insisted upon in all strains, and all the material was given the maximum opportunity of contracting blackarm and *Verticillium* wilt. At Serere the process of reducing a wide range of material to a number of well-defined

types was concluded. These types went forward for a final sorting of the fuzzy seed character and for a new programme for obtaining resistance to blackarm. The highest cotton yields at Kawanda were obtained with B.181 and its derivatives, and at Serere the B.P.50 family were pre-eminent, with B.181 second. Amongst the Nyasaland Upland cottons the order was: B.P.52, N.17, and S.29.

46. Grass Covers in their Relation to Soil Structure. By W. S. Martin. (*Emp. J. of Exp. Agr.*, January, 1944, p. 21.) Observations leading to the adoption of the grass rotation in Uganda are recorded. Under local conditions lime makes no contribution to crumb formation, whether applied alone or with organic manure. Organic manures in the form of green manure, cotton seed, or farmyard manure produce no increase in the number of water-stable crumbs, possibly because only a small fraction of the added organic matter attains colloidal dimensions. All grasses regenerate soil structure, but there is considerable variation between them. The formation of crumbs is basically dependent on the amount of clay in the soil, so that the grass rotation cannot be expected to be beneficial on soils of very low colloid content.

47. AUSTRALASIA. Queensland: Cotton Breeding. By R. W. Peters. (*Queens. Agr. J.*, September, 1943, p. 142.) A brief account of the work in connection with cotton breeding, selection, and hybridization carried out in Queensland with a view to developing early-maturing strains of cotton with good-sized bolls, capable of withstanding drought during critical stages of plant growth, and also resistant to jassid attack.

48. Cotton Seed Planting Rates. By W. G. Wells. (*Queens. Agr. J.*, August, 1943, p. 78.) Investigations conducted at the Biloela Research Station indicated that when using a variety of cotton with seed of medium size the following rates of planting will allow of the planting machine dropping approximately the indicated number of sound seeds per foot of row:

9 lb.	per acre	=2·8	seeds.
10 ,,	,,	=3·1	,,
11 ,,	,,	=3·4	,,
12 ,,	,,	=3·7	,,
13 ,,	,,	=4·0	,,
14 ,,	,,	=4·3	,,
15 ,,	,,	=4·6	,,

In order to ascertain what stand of seedlings could be obtained with such a range of quantities of seed, planting rates of 9 lb., 12 lb., and 15 lb. of delinted seed per acre were used in soil in satisfactory condition for giving a good germination. Actual counts made over an acre of soil indicated that the following number of seedlings per foot of row were obtained:

9 lb.	delinted	seed	=2·05	plants	per foot	of row.
12 ,,	,,	,,	=3·46	,,	,,	,,
15 ,,	,,	,,	=4·18	,,	,,	,,

It is not recommended that a planting rate be used which will give a stand of fewer seedlings than 3 to 4 per foot of row. As the above stands were obtained under very satisfactory conditions for securing a good germination of the seed, it can thus be seen how necessary it is to plant at least 12 lb. delinted seed per acre when using a 4½-ft. row spacing. A row spacing of 4 ft. would at the same rate of planting per foot require 13·6 lb. delinted seed per acre to give 3·46 plants per foot of row under good conditions.

Where it is necessary to use fuzzy seed, as when it is intended to plant a large acreage in dry soil, a planting rate of 20 lb. per acre is recommended.

49. Cultivation of Cotton. By W. G. Wells. (*Queens. Agr. J.*, December, 1943, p. 334.) Under Queensland conditions not more than three or four cultivations should be required after the one immediately following the thinning of the

plants if cotton is grown in rotation with Rhodes grass; on old cultivations as many as ten may be required. At each of these operations it is recommended that the soil be worked to the plants, for not only does this help to control weed and grass growth, but a firm brace is established around the plants, which assists in preventing them from being blown over during severe storms when the soil is wet. Where the rows are planted on the level contour across the slope this firm bracing of soil around the plants will also assist in retarding the run-off of storm waters. It is suggested that the riding two-horse drawn cultivator which straddles the row of cotton, and which the driver steers with his feet on the carriage supporting the tines, rather than depending entirely on guiding the horses, is the most suitable type of machine for cultivating cotton, especially young cotton. In recent seasons there has been a tendency for growers of large acreages of cotton to install cultivating equipment on light, fast-moving tractors, and this is to be commended, since two rows can be cultivated at the one trip, and the machine can be operated more continuously than horses, thus ensuring quicker and more economical cultivation.

50. Early Preparation of Grassland for Cotton. By L. M. Hodge. (*Queens. Agr. J.*, July, 1943, p. 14.) Experiments have shown that the best way to renovate a worn-out pasture in the farming districts is to practise a rotation. This involves ploughing and cropping to something else for two or three years, and cotton appears a most suitable crop for this purpose in the cotton-growing districts. It is suggested that the best time to plough grassland for cotton growing is usually near the end of the summer wet period, and an average depth of approximately 6 inches is considered suitable. Experiments over a series of seasons have indicated that it undoubtedly pays to plant cotton on land in the first or second season following the breaking-up of grassland. Not only is there a greater supply of moisture provided, but there is also a better balance of plant foods available for the cotton plants. In addition, where early ploughing of the grassland is performed there is definitely less weed and grass growth to combat during the growth of the cotton plant. The costs of cultivation are thus reduced and, in most seasons, an increase in yield of cotton is realized compared with old cultivations—as much as 700 lb. seed cotton per acre having been recorded—and an appreciable reduction in the cost of production per lb. of seed cotton is also achieved. Benefits are also realized in the grassland re-established following two or three seasons of cotton growing. The cultural operations restore suitable soil conditions for profitable growth of grass of high quality for three or four seasons. A decline in both yield and quality of the grass occurs after that period, and the land should then be rotated once more to cotton growing for a couple of seasons.

51. Thinning and Early Cultivation of Cotton. By W. G. Wells. (*Queens. Agr. J.*, November, 1943, p. 266.) The author states that in order to reduce the costs of both the thinning operations and the early cultivations the suitability of the crop for cross-harrowing should be carefully tested. Where the stand of seedlings is thick enough, and the surface of the field is sufficiently free of trash and pieces of roots to allow of cross-harrowing being done with a spike-tooth harrow, many bunches of cotton seedlings can be eliminated by this operation without adversely affecting the stand. The removal of these excess plants prevents the development of the spindly type of growth, which usually occurs with too thick a stand of seedlings. Where the stand is good enough to allow of three or four cross-harrowings being carried out, it has been found that only sturdy, well-rooted, fairly well spaced plants are left at the last operation.

A considerable acreage of cotton is ploughed out each season through the crops becoming overrun with grass and weeds. Undoubtedly much of this could be avoided if all growers maintained clean cultivation in the early stages of growth of their cotton crops. It is appreciated that, with the present labour position on many farms, it will be difficult to maintain a satisfactory state of cultivation by ordinary methods, and it is strongly recommended, therefore, that cross-harrowing be employed wherever possible, for a marked reduction in labour requirements to cultivate and thin the cotton crop can be effected thereby.

52. FIJI: ANNUAL REPORT OF DEPT. OF AGRICULTURE, 1941-42. By H. W. Jack. (*Agr. J.*, September, 1943. Recently received.) *Cotton.*—No seed was issued and the ginneries did not operate. The local demand for raw cotton for upholstery purposes provided an outlet for nearly half of the accumulated 1939-40 and 1940-41 stocks of ginned cotton. As the supply of kapok is cut off it may be necessary to plant cotton again shortly in limited areas.

53. WEST INDIES. MIXED FARMING: THE BASIS OF A SYSTEM FOR WEST INDIAN PEASANTS. By O. T. Faulkner and C. Y. Shepherd. (*Trop. Agr.*, July, 1943, p. 136.) A discussion of the subject under the headings of: Expansion of peasant agriculture; Devising a system of mixed farming; Increased production of food. The authors are of opinion that the preliminary investigations on mixed farming systems for the West Indian peasant should be based on the following presumptions: a part of each holding will be cultivated under long-term, erect, perennial, fodder grasses intended primarily for feeding on the soiling system—*i.e.*, by the daily cutting and carrying of the young green herbage to the livestock; the arable crops will have first claim on the farmyard manure, of which as large a quantity as possible, consistent with practical economy, should be manufactured annually; the fodder grass will be heavily manured, mainly with regular dressings of artificial fertilizers applied in quantities and proportions designed to maintain both high yields and good nutritive quality in the herbage; the predominant type of livestock will be dairy animals, in addition to a proportion of small stock varying in number and in kind in accordance with the environmental conditions; a substantial part of the crop and livestock produce will be sold off the holding, either for local consumption or export, whichever is the more profitable to the farmer.

54. BARBADOS: COTTON INDUSTRY, 1941-42. (*W. Ind. Comm. Circ.*, September, 1943, p. 169.) Whilst conditions were excellent for the sowing and establishment of cotton the yield was, on the whole, disappointing. The acreage under cotton was 1,142 acres compared with 453 acres in the previous season. The average yield, however, for plantation and peasant cotton was approximately 350 lb. of seed cotton per acre, a decrease of 50 lb. on 1940-41, attritutable mainly to attacks of *Alabama argillacea.*

55. COTTON PROSPECTS, 1943-44. (*W. Ind. Comm. Circ.*, December, 1943, p. 237.) By August, 1943, applications for seed to plant nearly 800 acres had been received, and with favourable weather conditions possibly 1,000 acres might have been planted. Unfortunately the last week of the month was excessively dry, and the small sowings already made had not germinated well, and it was considered that prolongation of the dry weather would render the establishment of the crop a very difficult matter.

56. MONTSERRAT: COTTON INDUSTRY, 1941 AND 1942. (*Ann. Rpts. Dpt. of Agr., Montserrat*, 1941 and 1942, received 1944.) *Cotton Industry*, 1941.—The planting season lasted from March 1 to May 17, and the crop was established quickly in fields prepared in time for the favourable rains which fell during the first fortnight of the planting season. Much damage was done to the crop by *Alabama argillacea* (cotton leafworm), pink bollworm, and aphids. Black boll was severe in some localities. The price paid for clean seed cotton was 5½d. per lb., and the clean lint was purchased by the Ministry of Supply at 1s. 10½d. per lb. f.o.b.

Cotton Industry, 1942.—The planting season lasted from March 1 to May 30. Dry weather during the first few weeks hindered the establishment of the crop, and a scarcity of labour when rains came was followed by excessive weed growth among the cotton. *Alabama argillacea* and pink bollworm caused serious damage, and black boll disease also did much to reduce the crop. The proportion of stained lint was higher than usual. The price paid for clean seed cotton was 5½d. per lb. and the clean lint was bought by the Ministry of Supply at 1s. 11½d. per lb. f.o.b.

57. COTTON EXPERIMENTS, 1941 AND 1942. (*Ann. Rpts. Dpt. Agr., Montserrat*, 1941 and 1942, received 1944.) 1941.—Progeny row work and the small bulk trials were carried out on more or less normal lines, and selected seed was multiplied as usual. Small stocks of pedigree seed were distributed to neighbouring islands for multiplication. In view of the success of the St. Vincent Ordinary strain, BD,

another St. Vincent strain, AN, was included with BD and V135 in a variety trial for comparison with the commercial Montserrat Sea Island (MSI). The results indicated that BD did not fulfil its earlier promise, the yield falling short of that of MSI by 118 lb. lint per acre. The price difference was quite inadequate to offset this deficiency. AN failed entirely to compete with MSI either in yield or quality of lint. Yield of lint per acre from V135 was half a bale less than MSI, and the gross value of the crop per acre was estimated at about £17 less than that of the local strain. It is clear that the superfine strain cannot compete with MSI in Montserrat. In a manurial experiment carried out on the light volcanic soil of Richmond Estate a 2½ cwt. per acre dressing of sulphate of ammonia applied to 1-month-old cotton plants produced an increase in yield of 410 lb. seed cotton per acre, a dressing of superphosphate at the same rate producing an increase of 176 lb. A similar trial conducted at Elberton provided evidence that phosphate may be the manurial factor limiting crop production on the heavy shoal soils of the North Leeward district.

1942.—Cotton selection and multiplication work was continued, and nucleus stocks were distributed to neighbouring islands. In connection with cotton manurial trials, a single level NPK experiment in which potash treatments appeared in half-plots was conducted. It embraced the four main soil types—recent ash, shoal, brown earth, and alluvium—and included sites on eleven different estates. Large increases in yield were observed in response to applications of nitrogenous artificial manures on certain nitrogen deficient recent ash, alluvial, and brown earth soils, and on the shoal sites good results followed the use of superphosphate.

58. St. Vincent: Cotton Industry, 1942-44. (*The Vincentian*, 24/12/43.) A reduced acreage was planted to Sea Island cotton in the 1942-43 season owing to dissatisfaction with the prices for the previous season's crop. Negotiations were under way during the planting season for an increase in price, but in the absence of any definite pronouncement many small growers preferred not to take the risk; later an increase of 3d. per lb. was granted. A further decrease in the Sea Island cotton acreage is anticipated for 1943-44.

A new development in regard to Marie-galante cotton was the extension by the Central Cotton Ginnery of the system of marketing on the profit-sharing basis to cotton grown in the Southern Grenadines. Hitherto this method of marketing applied only to Sea Island cotton, and growers of Marie-galante made their own marketing arrangements. This year (1943) growers were given the option of outright sale at a stated price to the Central Cotton Ginnery or sale on an advance at a slightly lower figure with a subsequent bonus on receipt of the account sales. All growers preferred the former, and the results of the sale of the 1941-42 crop indicated the price offered by the Central Cotton Ginnery to be better than the best net price obtained from independent sales.

A further development foreshadowed is the establishment of a Central Ginnery at Carriacou for dealing with the whole of the Marie-galante crop grown in Carriacou and the St. Vincent Grenadines. This proposal, which was recommended by the Cotton Adviser, Mr. J. B. Hutchinson, to the Inspector-General of Agriculture, has received the approval of the St. Vincent and Grenada Governments, and an application for financial assistance under the Colonial Development and Welfare Act is being prepared with the support of the Comptroller for Development and Welfare.

59. Notes on the Native Cottons of Trinidad. By J. B. Hutchinson. (*Trop. Agr.*, December, 1943, p. 235.) Two species of cotton have been long established in Trinidad—namely, Marie-galante, *G. hirsutum* L. var. *Marie-galante* (Chev.), Hutchinson, and free and kidney-seeded forms of *G. barbadense* and *G. barbadense* L. var. *braziliense* (Macf.) Hutchinson. According to Williams and Cheesman (1929) Marie-galante is " perhaps native, but of ancient cultivation and possibly naturalized in Trinidad and Tobago." They recorded it from " coastal banks and waste grounds inland." Of kidney cotton (the only variety of *G. barbadense* they considered) they stated that it is " probably naturalized " and is " cultivated; sometimes spontaneous in waste grounds."

Since the author has shown (1943) that in Jamaica Marie-galante cotton is frequent

in the dry zone whereas *G. barbadense* is confined to more mesophytic situations, quantitative data were collected on the distribution of the two types in different ecological areas of Trinidad varying from the heavily wooded country with cacao and other orchards in the heavy rainfall areas to open sugar-cane country where the rainfall is lower.

From casual observation it appeared that Trinidad cottons are generally to be found in house-yards, and, in the belief that their occurrence elsewhere would not be sufficiently frequent to vitiate the data, counts were made of the number of house-yards by the roadside with and without cotton shrubs. A careful watch was maintained for cottons growing in open scrub on abandoned lands, and none was found beyond the limits of house-yards, or immediately adjacent land which had obviously been under cultivation when the plants were established. It may be inferred that in the area surveyed cotton seedlings only established themselves in places artificially cleared for cultivation. It was further noted that cottons never occurred in house-yards heavily shaded by trees, and it appears evident that shade is the primary factor in limiting their distribution.

The total frequency of cottons in the orchard belt was only about 60 per cent. of that in the cane belt. It was noted also that whereas it was unusual in the orchard belt to see more than one cotton plant in a house-yard, in the cane belt they frequently occurred in small colonies of up to half-a-dozen plants. The distribution of the two species was even more distinct. Marie-galante occurred in 92 per cent. of the yards with cotton in the cane belt, and in only 44 per cent. of the orchard belt. Observations made on the variability of the two populations showed that red-leaved types occurred in both, but red was much commoner in Marie-galante than in *barbadense*, and in Marie-galante it was much commoner in the northern part of the area sampled than in the south. No reason can be given for this difference.

In the Marie-galante population two leaf shapes were observed, closely similar to those which Stephens (*in press*) has shown result from the action of the alleles l and L^E on a Marie-galante genotype. The laciniated leaf (L^O) type, common in Jamaica, was not recorded. It has been collected in Trinidad—the Cassava type used by Stephens (*in press*)—but it is evidently rare. No obvious differences in habit were seen, and no Marie-galante plants were flowering at the time (early October) when the counts were made. Among the *barbadense* cottons even less variability was observed. A few plants had just begun to flower, and all flowers seen were pale cream. The difference between the free-seeded, typical *G. barbadense* and the very large-leaved predominantly kidney-seeded *G. barbadense* var. *braziliense*, could usually be observed, but it was not sufficiently marked to be recorded in a rapid census in which only those plants were counted that could be seen from the road.

Young cotton shoots are used to make an infusion which is given to children as a vermifuge, and the lint is sometimes used for stuffing pillows and mattresses. Among the East Indians it provides wicks for lamps used for ceremonial purposes, but is not particularly favoured on this account, since there is no evidence that it is commoner in East Indian than in negro house-yards in the orchard belt. Cotton is frequently planted, and where it comes up from scattered seed it is very often encouraged and protected. Its complete absence from all kinds of clearings other than house-yards, and from scrub land, is good evidence that it is not indigenous in any part of the area sampled; but for the encouragement it receives it would rapidly die out. *G. barbadense* in particular, which is evidently best suited to clearings in the orchard belt, would very rapidly be extinguished by the closing of the forest canopy if human interference were to cease. Marie-galante cottons, on the other hand, are found on the comparatively dry western coasts and islands of Trinidad, and the possibility that they may be indigenous there cannot be ruled out.

60. Trinidad and Tobago: Report of the Agricultural Policy Committee. (Govt. Printer, Trinidad, 1943. Price 50 c.) The Report of the Agricultural Policy Committee appointed by His Excellency the Acting Governor of Trinidad and Tobago on June 2, 1942, with the following terms of reference: (1) To define the objective of a policy for agricultural development in Trinidad and Tobago; (2) to

formulate a long-term policy for such agricultural development; (3) to lay down the broad lines of experiment and research programmes; (4) to suggest the means required for the dissemination to producers of the results of research and methods for agricultural advance; (5) to make proposals for the closer co-operation between producers and their organizations with Government, especially in regard to research, extension services and marketing; (6) to review the relationship of the Government services or Government appointed bodies which are now concerned with agriculture, and to submit proposals for their development or improvement; (7) to examine the structure and establishment of the Department of Agriculture in relation to the proposed policy and programmes for future work and to submit such recommendations in regard to staff, organization and other facilities as may be necessary to enable the Department to carry out the agricultural policy proposed for the future. For convenience, the report is set out in two parts.

Pt. I. deals with policy and the guiding principles for the long-term organization of agricultural and rural communities in Trinidad and Tobago; it includes terms of reference numbers 1, 2, 4, 5 and 6 as enumerated above.

Pt. II. While agreeing with the West Indian Royal Commission (1938-39) that "the outstanding agricultural need in the West Indies is more intensive use of the land with increased production of food in order to support a rapidly growing population," the Committee holds that the maintenance of the standard of living of large numbers of people will continue to depend on technical efficiency in the production of export crops. It is therefore necessary to devise systems of agriculture which will meet both these requirements. Such systems must depend on the maintenance and improvement of soil fertility. Research on special products must also continue.

The required research programmes are set out in some detail, mainly under the headings: Research for Orchard Crops (ecological, physiological and genetical); Research in the Cane Area, Animal Husbandry (animal breeding, nutrition, and diseases) and Mixed Farming.

Section II puts forward detailed proposals for the organization and staffing of the Department of Agriculture, including provision for services covering extension work, plant protection, land settlement, marketing, agricultural finance and credit societies, and agricultural education.

COTTON IN THE UNITED STATES.

61. AMERICAN COTTON CROP: COST OF PRODUCTION. U.S. Dept. of Agr. (*Text. Wkly.*, **32**, 1943, p. 9. From *J. Text. Inst.*, September, 1943, A429.) Tables show the weighted average prices received by American farmers from 1930 to 1942 for cottonseed and lint, and the estimated costs of producing cotton, under various headings and for various States and regions.

62. WAGE RATES FOR PICKING COTTON, 1942-43. (*Cotton*, M/c, 12/2/44.) The U.S. Dept. of Agriculture's latest Farm Labour bulletin on the average wage rates for picking 100 lb. seed cotton show the rates paid this season to be the highest on record. The average rate for picking 100 lb. seed cotton in the United States as a whole was \$1.69, as against \$1.41 last season, \$1.09 two seasons ago, and only \$0.62 three seasons ago.

63. AMERICAN COTTON INDUSTRY: POST-WAR DEVELOPMENT. By C. T. Murchison. (*Cotton*, U.S., **107**, 7, 1943, p. 81. From *Summ. Curr. Lit.*, xxiii., **21**, 1943, p. 571.) The writer discusses the immediate post-war problems of the American cotton industry under the headings (1) the termination of Government contracts and controls, (2) "Lend-lease" needs and exports to the Far East, (3) American raw cotton policy, and (4) conversion of the industry to normal requirements. On the need for research he says: "All scientists agree that cotton research is still in its infancy. We know extremely little of the physical properties of the fibre itself and have only begun to visualize the possibilities of chemical treatment of the fibre."

64. SEA ISLAND COTTON PRODUCTION. (*Cotton*, M/c, 26/2/44.) The production of Sea Island cotton in the United States has been sharply reduced during recent

seasons. Production for the 1943-44 season is estimated at only 300 bales compared with 800 bales produced in the previous season.

65. Correlation of Combed Staple Length on the Cottonseed with Commercial Staple Length in American Upland Cotton. By J. H. Moore. (*J. Amer. Soc. Agron.*, **35**, 1943, p. 491. From *Pl. Brc. Abs.*, xiv., **1**, 1944, p. 60.) A highly significant correlation coefficient ($r = +0{\cdot}89$) has been found between combed staple length and commercial staple length determinations.

66. Textile Research: Organization for War. By F. S. Blanchard. (*Mech. Eng.*, **65**, 1943, p. 205. From *J. Text. Inst.*, August, 1943, A428.) The effects of the war on textile research in America are briefly discussed. The work of the various organizations contributing to textile research is reviewed, particular attention being paid to the rôle of the Textile Research Institute and Textile Foundation, and the Textile Research War Council. Reference is made to work on the conservation of wool, the substitution of cotton rope for manila and sisal, the utilization of high-strength cotton yarns in military equipment, aviation clothing, accelerated ageing of military fabrics, resistance of fabrics to ultra-violet light, rayon problems, military finishing requirements, and the warp-sizing of spun rayons.

67. Cotton Operatives: Training. (*Text. World*, **93**, 7, 1943, p. 50. From *Summ. Curr. Lit.*, xxiii., **21**, 1943, p. 571.) Particulars are given of a scheme for the quick training of new operatives, devised at a large mill in the Southern States in conjunction with the United States War Man-power Commission (W.M.C.). The scheme includes the grading of tasks in order of difficulty, and the sequences are shown for the separate major processes of carding, spinning, spooling, warp twisting and winding, weft twisting, sizing, beaming, drawing-in, weaving, burling and baling. Various jobs are also broadly defined and the tasks set out in order on clear " Operation sheets "; the sheet for carding, for which six weeks' training is allocated, is reproduced as an illustration.

68. Arkansas. Sulphur Deficiency and its Effect on Cotton Production on Coastal Plain Soils. By O. R. Younge. (*Soil Sci. Soc. Amer. Proc.*, **6**, 1941, p. 215. From *Exp. Sta. Rec.*, **89**, 2, 1943, p. 184.) Fertilizer treatment with sulphur and its effect on cotton production is reported for ten soil types in the Coastal Plain of south-western Arkansas. Of the 10 sites reported, 6 showed significant yield reduction where sulphur was not applied, as compared with applications of 12 lb. of sulphur per unit of 4-10-4 fertilizer. The maximum reduction recorded is 104 lb. lint per acre, or 10 per cent. for a basic treatment of 8 units of 4-10-4 fertilizer. As an average of all 10 sites, the lint yield reductions were 26 and 42 lb. per acre at the 4- and 8-unit treatment rates respectively, or a decrease of 7 and 10 per cent. at each rate, representing a net loss of approximately \$4 and \$6 per acre respectively at prevailing prices. Sulphur deficiency is shown to cause a marked reduction in the number of bolls produced. The mean reductions for 7 sites operating in the same season were 9,000 and 15,000 bolls per acre at the 4- and 8-unit rate of 4-10-4 treatment respectively, where sulphur was not applied. The reduction in number of bolls was associated with reduction in yield, as boll size was not appreciably affected. Insufficient sulphur was shown to delay growth development, as indicated by the lower percentage of the yield being ready for harvest at the first picking, the reduction amounting to 7 units in terms of per cent. earliness, or about one-ninth. Sulphur deficiency was found to have little effect on staple length, size of bolls, and lint outturn. Yields of seed cotton and seed were found to vary directly with the associated lint yield.

69. Florida: New Strain of Sea Island Cotton shows Promise. (*Sth. Seedsman*, **6**, 4, 1943, p. 41. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 345.) Mention is made of an improved strain, Z-10, of the Old Seabrook variety of Sea Island cotton, which in tests at Florida Agricultural Experiment Station has given a good yield.

70. Georgia: Field Crops Research, 1942. (*Ga. Sta. Rpt.*, 1942. From *Exp. Sta. Rec.*, **88**, 5, 1943, p. 617.) Work on cotton included breeding, varietal, and fertilizer experiments; regional cotton variety wilt tests; sources of P for cotton with and without gypsum; minor elements for cotton limed to different *p*H levels: nutrition

of cotton, comparing ammonium and nitrate N with added trace elements; tests comparing treated and untreated anthracnose-infested cottonseed.

71. Cotton Experiments. (*54th Ann. Rpt. Ga. Exp. Sta.*, Experiment, Ga., 1941-42. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 26.) Coker 100-wilt, a new variety derived from Clevewilt × Coker 100, combines earliness with wilt resistance. Varietal tests are reported, special attention being paid to wilt resistance. The strain 136-4-4 is being selected for such characters as lint yield and earliness.

72. Cotton Selection Work. (*22nd Ann. Rep.*, 1941-42. Ga. Cst. Pl. Exp. Sta. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 26.) Tifton Station 21, an individual plant selection from Dixie Triumph, combines good yield and quality with wilt resistance and adaptability to conditions in South Georgia.

73. Callaway Textile Research Institute. By R. W. Philip. (*Cotton*, U.S., **107**, 4, 1943, p. 75. From *J. Text. Inst.*, September, 1943, A452.) The Callaway Institute, Inc., La Grange, Georgia, has been established as a non-profit organization to be devoted to research and education, its facilities and services being available, by contract, to any mill or other element in the textile industry or to any other type of business it is qualified to serve. It has for a nucleus the Callaway Mills research department and is housed in the Callaway Vocational School, the activities of which it is continuing and broadening. The Institute is, however, autonomous, and though much of its current work is for the Callaway mills, this work is entirely on a contractual basis. The activities of the Institute will not necessarily be confined to the textile industry, although the major interest will doubtless continue to be in this field. Notes on the personnel and plans of the building are given.

74. Louisiana: Cottonseed Treatment for Stand Improvement. By D. C. Neal. (*N.E. Louisiana Sta. Bien. Rpt.*, 1941-42. From *Exp. Sta. Rec.*, **89**, 6, 1943, p. 687.) The results of cottonseed treatment tests at the Baton Rouge and St. Joseph Stations from 1936 to 1941 are believed to justify the following conclusions: Regular ginned (fuzzy) seed should be treated with Improved Ceresan (1·5 oz. per bushel) or Ceresan (3 oz. per bushel); with delinted seed the amounts may be reduced (1 and 2·5 oz. per bushel respectively.) Other dusts giving higher emergence of healthy seedlings than with untreated seed were Cuprocide, Spergon, and Spergonex. Reginning or machine delinting of cottonseed and delinting by H_2SO_4, followed by Ceresan dust treatment, usually resulted in better stands and more rapid germination than the use of fuzzy stock. Precautions in the use of the poisonous mercury fungicides are given.

75. Station Miller Cotton. By H. B. Brown. (*La. Sta. Circ.* 29, 1943. From *Exp. Sta. Rec.*, **89**, 2, 1943, p. 206.) The strain of Station Miller cotton currently grown is, according to test results, a relatively good producer, has a medium large boll (60-65 per lb. of seed cotton), is a good picking cotton with staple length from $\frac{31}{32}$ to $1\frac{1}{32}$ inches and lint percentage of 34-37, has considerable wilt tolerance, and the seed has a high oil content. Data on fibre characters indicate spinning qualities satisfactory for a short-staple cotton. It is considered desirable for hill lands in North Louisiana.

76. Mississippi: Registration of Improved Cotton Varieties—III. By H. B. Brown. (*J. Amer. Soc. Agron.*, **35**, 1943, p. 241. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 345.) Bobshaw, a selection from Stoneville cotton made at Heathman, Miss., with superior fibre qualities, is described. It is a medium-early cotton, but only moderately resistant to wilt.

[*Cf.* Abstrs. **527**, Vol. XIV. and **541**, Vol. XVII. of this Review.]

77. Complete Fertilizer Needed by Soils of South Mississippi. By R. Coleman. (*Miss. Farm. Res.*, **5**, 12, 1942, p. 7. From *Exp. Sta. Rec.*, **88**, 5, 1943, p. 599.) A complete fertilizer high in potash gave the most profitable production of cotton, but it is suggested that a good crop of Austrian winter peas fertilized with basic slag can largely replace the nitrogen and phosphorus for Brandon silt loam.

78. The Rate of Application of Ceresan to Cottonseed. By W. Ray. (*Pl. Dis. Rptr.*, xxvi., **22**, 1942. Mimeographed. From *Rev. App. Mycol.*, xxii., **12**, 1943, p. 478.) When seed of Stoneville 2B cotton (1) fuzzy, (2) reginned, and

(3) acid-delinted was treated with new improved ceresan at the rates of ½, 1, and 1½ oz. per bushel, and planted, the treatment, regardless of the rate of application and the kind of seed, gave stands statistically superior to those of the controls. No significant differences were found for the amount of ceresan applied when expressed in percentage of final stand. The acid-delinted (gravity-graded) seed was superior in point of stand to the other kinds. These results show that the amount of ceresan applied to fuzzy, reginned, and acid-delinted cottonseed can safely be reduced to less than 1½ oz. per bushel.

79. Barnyard Manure: Value for Crops and Pastures. By J. S. Moore. (*Miss. Farm. Res.*, **6**, 5, 1943, p. 7. From *Exp. Sta. Rec.*, **89**, 4, 1943, p. 419.) The Station Dairy Dept. in a ten-year programme, by the use of barnyard manure and other methods of conserving and increasing soil fertility, produced during the first five years an average of 323·6 lb. of lint cotton per acre, and during the last five years an average of 429·4 lb.

80. Delta Soils Vary in Fertilizer Needs for Cotton Growth. By R. Kuykendall. (*Miss. Farm. Res.*, **5**, 11, 1942, p. 2. From *Exp. Sta. Rec.*, **88**, 4, 1943, p. 454.) The importance of the proper programme of fertilization for obtaining maximum yields on soil types of the Yazoo-Mississippi Delta is pointed out. The most profitable practice was found to be winter legumes followed by cotton and fertilized with 20 lb. per acre of commercial nitrogen.

81. Soil Management Practices on Delta Buckshot Soils. By J. Pitner. (*Miss. Farm. Res.*, **6**, 5, 1943, p. 7. From *Exp. Sta. Rec.*, **89**, 4, 1943, p. 418.) Winter legumes made this soil more productive for cotton than did sorghum. The further addition for the cotton of 30 lb. nitrogen as sodium nitrate gave the best yields. Experimental results emphasized the importance of fallowing buckshot soils. Yield data from various experiments on buckshot lands are tabulated.

82. Missouri: Cotton Improvement in the South-East. By J. R. Paulling. (*J. Amer. Soc. Agron.*, **35**, 5, 1943, p. 409. From *Exp. Sta. Rec.*, **90**, 1, 1944, p. 42.) Progress and accomplishments in the Missouri cotton improvement programme are reviewed for the period 1936-42.

83. North Carolina: Effect of Vitamin B_1 on Field Crops Grown on Several North Carolina Soils. By W. W. Woodhouse, Jr., and H. D. Morris. (*J. Amer. Soc. Agron.*, **34**, 4, 1942, p. 322. From *Exp. Sta. Rec.*, **88**, 5, 1943, p. 619.) Application of B_1 apparently was not effective in increasing yields of cotton and corn on any of the six soils studied, except on extremely poor Durham sandy loam, and its addition to cotton and corn fertilizers in the area is not advised.

84. Reginning and Dusting Cottonseed Help to Win the War. By S. G. Lehman. (*Res. and Frmg.*, **1**, 2, 1943, p. 5. From *Exp. Sta. Rec.*, **89**, 4, 1943, p. 454.) Reginning to remove the linters has been found to carry off much of the load of fungus spores and bacteria adhering thereto, and subsequent treating of the seed with a disinfectant saves many seedlings that would otherwise die of disease and makes possible a lower seeding rate. Supporting data are presented.

85. Oklahoma: How to get Better Cotton Yields in 1943 by Seed Treatment. By K. S. Chester and W. W. Ray. (*Circ. Oklahoma Agr. Exp. Sta.*, C-109, 1943. From *Rev. App. Mycol.*, xxii., **10**, 1943, p. 386.) In 1942 much of the cottonseed sown in Oklahoma was imported from other States and had been treated, with the result that the crop for that season was good, whereas the seed to be sown in 1943 is home-grown and must be treated. Five years' tests showed that seed disinfection (at a cost of only a few cents per acre) gave an average increase in yield of 19 per cent. Seed treatment is important because it prevents or delays infection by the most prevalent and serious cotton disease in Oklahoma, angular leafspot. The most useful treatment under local conditions is that with new improved ceresan, but as this chemical is likely to be in short supply, 2 per cent. ceresan is recommended, though if the seed is to be sown in neutral to alkaline soils, spergon may be substituted. Instead of the 1½ oz. of new improved ceresan per bushel of fuzzy seed usually applied, the amount may be reduced to 1 oz. or even to ½ oz. if the dust is well mixed with the seed. The dosage of 2 per cent. ceresan can be reduced from 3 to 2 or 1½ oz. per

bushel if applied to reginned seed. With spergon the dosage may be 3 oz. per bushel of fuzzy seed, or 2 oz. per bushel of reginned seed. The seed should be stored in a fairly air-tight container for 24 to 48 hours after being treated. When treated cottonseed is used, the sowing rate may be reduced by one-third without impairing the stand. Thus, the cost of seed and chopping can be lowered, and seed conserved for war uses. In general, ½ bushel of treated seed gives as good a stand as ¾ bushel of untreated, if sown at a moderately even rate. Seed may be treated from one day to a year before sowing. Directions are given for making a metal drum seed treater and one of the box type.

86. SOUTH CAROLINA: COTTON EXPERIMENTS. (*54th Ann. Rpt., S. Car. Exp. Sta. of Clemson Agr. Coll.*, 1941. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 23.) Super 7 has been selected for resistance to wilt, fibre length and fibre uniformity. Considerable work has been done with Sea Island cotton varieties, but it has not been found possible to obtain satisfactory forms from hybrids between Sea Island and Upland varieties, although breeding for this purpose has been in progress since 1935. Fibre characters, however, appear to be inherited independently of general plant characters, and there appears to be some prospect of transferring the fibre character of Sea Island strains to Upland cotton by a process of hybridization and back-crossing. Strain Z10 of Seabrook is being selected for higher lint percentage and strain 12B2 for longer staple. St. Vincent, a variety resistant to angular leafspot, has produced a strain with larger bolls in Florida. Progeny of the following hybrids are being investigated: Seabrook × Andrews, Seabrook × Westberry, Seabrook × St. Vincent, and (Seabrook × Westberry) × (Puerto Rican × Bleak). Genetical studies have been made with the progeny of three crosses. Half-and-Half × King Blackseed has been studied for the inheritance of lint length and lint percentage, Tidewater × Rowden for staple length and lint percentage, and Greenseed × Rowden for seed colour, staple length, lint percentage, seed weight, weight of seed cotton per plant, number of bolls per plant, and weight of seed cotton per 100 bolls.

87. TENNESSEE: COTTON VARIETAL TESTS. (*54th Ann. Rpt. Agr. Exp. Sta., Tennessee*, 1941. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 306.) It has been found that varietal resistance to *Fusarium* wilt is more precisely estimated from the number of plants killed than from the number affected. Although strains of the fungus have been isolated with varying degrees of virulence no differential resistance by the varieties to these strains has been observed. Coker 4-in-1 came out best in varietal tests for wilt resistance, and crossing has been effected between wilt-resistant varieties and Upland cotton strains.

88. TEXAS: COTTON PRODUCTION. (*Cotton*, M/c, 11/3/44.) According to Dr. A. B. Cox, of Texas, cotton has lost considerably in importance in the economy of the State since 1928. The farm cash income received from cotton and cottonseed in Texas declined from over $500,000,000 in 1927 to less than $150,000,000 in 1939, and increased to a little over $300,000,000 in 1942 as a result of war prices. Dr. Cox points out that the very serious unemployment and re-employment problems in the post-war period, involving over 500,000 workers in Texas alone, mean that the State must utilize every source of employment to the limit in this adjustment period. Cotton production and harvest is the biggest employer of labour in agriculture. According to the Texas Agricultural Experiment Station, cotton grown with two-row tractor equipment requires about 25 man-hours per acre, whereas grain sorghums grown under the same condition require only 10 hours, and small grains less than 3 hours. Moreover, an increase in cotton acreage means increased opportunities for employment in many more ways than just cotton production. The world market will readily absorb all the cotton Texas can grow, at a reasonable price, provided equitable trade relations can be quickly established after the war.

89. EFFECTS OF PLANTER ATTACHMENTS AND SEED TREATMENT ON STANDS OF COTTON. By H. P. Smith and M. H. Byrom. (*Bull.* 621. Texas Agr. Exp. Sta., 1942.) Results are given of studies to determine the effect on stands of cotton of several planter attachments such as different types of furrow openers, press wheels, planting at variable depths, and the treatment of undelinted seed and de-

linted seed with ceresan, lime, and sulphur. All the experiments were conducted at the Main Station Farm on Lufkin fine sandy loam. This soil has a tendency to pack and crust after rains, which sometimes results in poor emergence of cotton. Better stands of cotton were obtained when the furrow for the seed was opened with a knife or runner type furrow opener than when opened with either a narrow or wide shovel opener. The average percentage of emergence for the three types of furrow openers was 72·5, 59·3, and 55·55 per cent. respectively. The knife opener gave better results, probably because it left a clean furrow and a firm seedbed with little loose soil. It does not disturb the soil enough to cause it to dry out as rapidly as when the furrows are made by shovel openers. A narrow shovel 1⅜ inches wide, with shields to hold the loose soil out of the furrow until the seed reached the bottom of the furrow, gave better results than a wide shovel 4 inches in width. The regular open centre press wheel used after covering the seed and in combination with a knife opener gave a slightly higher percentage of emergence than other types of press wheels. Rolling on the seed and pressing them in the bottom of the furrow before covering did not give any better stands than when the soil was pressed with an open centre press wheel after covering. All types of press wheels gave slightly better stands of cotton on the Lufkin fine sandy loam than when no press wheel was used, indicating that the press-wheel attachments were beneficial. Cottonseed planted at a constant depth gave better stands and yields on the Lufkin fine sandy loam than cottonseed planted at variable depths. The treatment of cottonseed with ceresan produced significant increases in the emergence of cotton seedlings. Lime, however, reduced emergence to some extent. Sulphur apparently had no effect on germination and emergence.

90. Reducing Labour and Power in Cotton Production. By H. P. Smith. (*Agr. Eng.*, **24**, 5, 1943, p. 149. From *Exp. Sta. Rec.*, **89**, 4, 1943, p. 488.) The principal means whereby the power and labour requirements of this crop may be lessened are held to be (1) the use of larger units and the performance of two or more operations at the same time; (2) mechanical thinning, hill dropping of mechanically delinted seed, and planting thinly; (3) the treatment of planting seed to obtain better stands, thus reducing replanting operations; (4) shallow cultivation; and (5) the use of mechanical harvesting equipment. It is further pointed out that a suitable mechanical harvester in the plains areas would reduce almost by one-half the total labour required to produce a crop. In these areas a simple, cheap, stripper-type machine can be used satisfactorily. In sections where the plants grow larger and the harvest is earlier, a picker-type machine would probably be more suitable.

91. Cottons Resistant to Wilt and Root Knot and the Effect of Potash Fertilizer in East Texas. By P. A. Young. (*Bull. No.* 627. Texas Agr. Exp. Sta., 1943.) In East Texas sandy-loam fields *Fusarium* wilt, nematode root knot, and potash hunger frequently decrease cotton yields to a serious extent. Two or more of these troubles may be associated in the same field, and these factors in combination present unusually difficult problems to the grower. As a result of six years' tests in East Texas the following cotton varieties (given in decreasing order of probable value) were found to show high resistance to *Fusarium* wilt: Coker 4-in-1, Coker 100 Wilt Resistant Strain 39-5, Delta Dixie W.R. Strain 2, Tifton Dixie Triumph, Dixie Triumph 25-12, Dixie 14-5 Strain 2, Delfos 425, Miller 610, Deltapine 12, and Stonewilt. In addition Coker 4-in-1, Coker 100 W.R. Strain 39-5, and three strains of Dixie varieties were found to be resistant to wilt and root knot together. The Miller 610 variety lost much of its wilt resistance when root-knot nematodes were abundant in the same field. In these experiments, wilt resistance usually was lowered when the plants suffered from potash hunger ("rust"), and applications of 24-48 lb. of potash per acre increased the wilt resistance of most of the varieties tested. Potash also prevented symptoms of potash hunger, and greatly increased the yields. Phosphate had no apparent effect on wilt resistance of cotton. The experiments indicate that by growing only the varieties of cotton that are resistant to the combination of wilt and root knot, by using high-potash balanced fertilizers, and by rotating cotton with *Crotalaria* and sorghum, planters can prevent wilt and root knot from becoming a limiting factor in cotton production on their farms.

COTTON IN EGYPT.

92. Egypt: Cotton Industry, 1943-44. (*Man. Guar.*, 11/10/43.) The area planted to cotton this season is estimated at 712,810 feddans, against 705,890 feddans in 1942-43. The area planted to Giza 7 is given as 162,294 feddans, compared with the previous season's 161,025 feddans—the smallest since 1933—and in view of this comparison some traders here have expressed doubts as to whether it will in fact be necessary to prepare for a serious shortage of that variety in future. It should perhaps be pointed out that, in 1939 for example, the area planted to Giza 7 was 601,000 feddans, yielding 2,550,000 kantars. By 1941 the yield had fallen to 1,942,000 kantars from an area of about 458,000 feddans, while last season the yield of Giza 7 was only some 683,000 kantars out of a total yield of long-stapled varieties of 2,127,000 kantars. In view of these figures it would appear likely that a shortage of this cotton has been developing since about 1940, and that it would have become acute much sooner if it had not been possible, after Italy's entry into the war seriously curtailed the possibility of exports from Egypt, to supplement each season's production from accumulated stocks. If the stocks are now exhausted, as they are believed to be, consumers have no supplies in sight until this year's production—possibly only about 25 per cent. of the pre-war quantity—becomes available. Last season Zagora was the variety to which the largest area was planted, Giza 7 showing an area about 7,700 feddans less. This season, Karnak (Giza 29) has the largest area—375,000 feddans—while Giza 7, with only 162,294 feddans, is nearly 213,000 feddans less: no Zagora has been planted this season.

93. Egyptian-Type Cottons: their Origin and Characteristics. By T. H. Kearney. (U.S. Dpt. Agr., Bur. Pl. Indus., Soils, and Agr. Eng., Beltsville, Md., 1943.) The discovery of Jumel cotton is first discussed, and is followed by an account of the origin and characteristics of the varieties which appeared successively during the period 1860-1925: Ashmouni, Gallini, Mit Afifi, Abbasi, Yannovich, Nubari, Sakel, Assili, Voltos, Zagora, Pilion, Casulli, Fouadi, Nahda, and Giza 3. The origin and characteristics of the varieties now in commercial production are then dealt with: Ashmouni (including Zagora), Giza 7, Wafeer (Giza 12), Menoufi (Giza 36), Karnak (Giza 29), Sakel (Sakellaridis), Sudan Sakel, Sakha 4, Malaki (Giza 26), and Maarad. The spinning capabilities are discussed of Ashmouni (Zagora), Ashmouni (Uppers), Wafeer, Giza 7, Maarad, Sakha 4, Sakel, and Malaki. Further sections of the report deal with the following: Parentage of the American-Egyptian varieties; Crop statistics of the varieties in Egypt in 1942; Boll and seed characters of the Egyptian varieties; Fibre properties of the varieties grown in Egypt in 1942; Statistics of acreage and production, etc. 26 references to the literature on the subject are cited.

94. Egyptian Cotton: Long Staple Varieties. (*Cotton*, M/c, 2/10/43.) The decrease in the supply of Sakellaridis cotton some years ago led to the establishment of Giza 7 as the most important, quantitatively, of the Egyptian long-stapled varieties. Now a decline in the production of Giza 7 has been brought about by the relatively low prices available for this type, the decrease in Egyptian cotton production generally, and the popularity in the country of one of the newer varieties, Karnak, formerly known as Giza 29. In raw cotton circles in Egypt the opinion seems to be that the best substitute for Giza 7 is Menoufi (formerly known as Giza 36), which has a staple somewhat shorter than that of Karnak, and it is suggested that Karnak is longer than is necessary for most ordinary spinning purposes. At the moment, however, the prospective supply of Menoufi is not large.

COTTON IN OTHER FOREIGN COUNTRIES.

95. Argentina: Memorial Anual de la Junta Nacional del Algodon, 1942. (Min. de Agr. Argentina, No. 65, 1942. Received 1944.) A detailed report of the progress made in the cotton industry during the 1941-42 season and of the measures taken to maintain the improvement. The various sections of the report deal with

the following: production; marketing; the textile industry; the work of the Experiment Stations; cottonseed multiplication; technology; labour in the agronomic regions; co-operative societies; encouragement of cotton cultivation in new areas, etc.

96. Boletin Mensual. (Min. de Agr., Junta Nac. del Algodon, Buenos Aires, 1942, 1943.) *Bulletins* Nos. 91-99 contain the following among other papers in Spanish: "The standard of cottonseed for the industry" (E. J. Pecora and J. Abitbol); "The effect of irregular stands on cotton yields" (A. Banfi); "The cost of mechanical harvesting of cotton" (R. Garcia-Mata and A. Franchelli); "Cultivation (improved) for the profitable use of the whole cotton plant" (F. K. Cameron); "Defoliation (artificial) of the cotton plant, and mechanical harvesting" (R. Garcia-Mata and A. Banfi); "Preventive measures adopted against the *Gorgojo pardo* of cotton"; "Notes on the biology of *Conotrachelus denieri* Hust., a pest of cotton" (P. C. Denier); "New procedure for evolving varieties of cotton" (A. Banfi); "The mechanical efficiency of cotton picking machines"; "New measures decreed for combating *Gorgojo pardo*"; "Cotton in the Argentine Republic: A Brief History" (R. Garcia-Mata); "Cotton in the post-war world" (R. E. Barbagelata); "Contribution to the knowledge of the *Chinche tintorea, Dysdercus sp.*, with notes on the biology" (A. Freibert). Statistics are also included of acreage, production, prices, exports, etc.

97. Juntalgodon-brebbia Cotton. (*Bol. Mens.* 91-92. Junta Nac. del Algodon, 1942.) This cotton has been produced by selection from a sample of seed of a non-commercial variety brought from the United States in 1938. The plant is characterized by a straight stem with one or two very short vegetative branches at the base. The fruit-bearing branches are 10-15 cm. in length and carry an abundance of large bolls. Multiplication of the strain is now in its third year, and about 80 hectares have been planted with the variety. Last season 2,629 kg. of raw cotton were obtained from 15,849 plants, a yield of 166 gm. per plant. Ginning percentage is 34, and the fibre length 30 mm. The variety is considered to be decidedly superior to those at present in cultivation.

98. Belgian Congo: Expérimentation Cotonnière: Adaptation de la Technique aux Conditions Locales. By M. Engelbeen. (*Bull. Agr. du Congo Belge*, xxxiii., **3-4**, 1942, p. 278.) The scope of the problem of adapting the experiment to the normal cultural conditions is illustrated by a concise history of the evolution of cotton experimental work, and by means of examples. The work of Fisher, Papadakis, and Harris and Scofield is discussed.

99. Brazil: Cotton Industry, 1942-43. (*Bd. Trade J.*, 26/2/44, p. 73.) The production of seed cotton during the 1942-43 season is estimated at 1,136,000 tons. The crop is of very good quality, classification up to November 30, 1943, showing that the percentage of type 5 (basic) and higher, at 85·95 per cent., is the best ever recorded, and compares with only 36·28 per cent. in 1941-42.

In regard to the 1944 crop, although the quantity of seed planted to cotton in the State of São Paulo has been limited to that sown in 1943, it is considered that owing to favourable weather conditions at planting time the yield might reach 500,000 tons, or, say, 120,000 tons more than the record of 1941.

100. The Cotton Industry in Free China. (*Cotton*, M/c, 9/10/43.) A report from Chungking is to the effect that cotton spindles now operating in the five provinces of Szechwan, Shense, Hunan, Kwang-tung and Yunnan total about 250,000, or almost fifteen times the pre-war figure for what is now Free China. Altogether, there are thirty-three cotton mills, most of which have migrated from the war areas.

101. Science in China. (*Nature*, 26/2/44, p. 247.) A pamphlet entitled "The Place of Science in China," by Yap Pow-Meng, honorary secretary of the National Science Society of China, British Branch (published by the China Campaign Committee, 34, Victoria Street, London, S.W.1. Price 6d.), attributes the failure of the scientific method to establish itself in the intellectual tradition of China mainly to social and economic reasons. From the first, the makers of the revolution of 1911 seized upon science as a means of achieving their ideal of a progressive, industrialized

China, and the pamphlet gives a brief account of the organization of education in science, of scientific research institutions—including the Academia Sinica, which is essentially an organization providing facilities for scientific research—and private technical research institutions, of which the most important is the Hangwai Institute of Industrial Chemistry. The majority of the research institutions of China were founded in the coastal areas and have now been moved to the west and south-west. Apart from those of the Radium Institute of the Peiping Academy and the Metals Research Institute and Science School of the National Tsing-hua University, Chinese researches in physics and chemistry have not so far been impressive, and in China as elsewhere experimental psychology has not made a complete break from the old philosophical psychology. The pamphlet also includes some account of the organization of science in China's war effort.

102. MEXICO: COTTON PRODUCTION. (*Cotton*, M/c, 4/3/44.) Recent favourable yields and good prices have encouraged cotton plantings in Mexico to the extent that this year's expected production of 114,000 tons will establish a new record, according to the U.S. Dept. of Commerce.

103. COTTON CULTIVATION IN THE LAGUNERA REGION. By V. M. A. Antognoli. (*Bol. Mens. Junta Nac. del Algodon*, 94, Argentina, 1943. From *Summ. Curr. Lit.*, xxiv., **4**, 1944, p. 73.) An account is given of the soil, climate, provisions for irrigation, communications, markets, methods of cotton cultivation and harvesting, cotton pests and diseases, and facilities for ginning in the Lagunera (lagoon) region of Mexico, which comprises parts of the states of Coahuila and Durango. The cotton grown is chiefly the variety Maravilla del Sur. Costs of production are rather high. Yields average 1,500 kg. per hectare, but in some parts may rise to 2,500 kg.; ginning percentages are often as high as 40 per cent., and the grade of the fibre is very good.

104. RUSSIA: COTTON RESEARCH. We have recently received from the Dept. of International Exchange, All-Union Lenin Library, Moscow, two publications from Experiment Stations in Tashkent, dated 1939, containing the following articles on cotton, in Russian with English summaries: I. "Some peculiarities of the vernalization of different American and Egyptian cotton varieties" (J. D. Naghibin); "Practical selection of cotton based on the stages of plant development" (I. K. Maksimenko); "On the question of biology and classification of cottons" (N. N. Konstantinov); "Requirements in nitrogen and phosphorus of the cotton plant in different stages of its development" (V. I. Tzivinsky); "Fruiting as one of the factors controlling transportation process in the cotton plants" (V. I. Tzivinsky); "A contribution to the determination of fibre length" (M. I. Eidelnant); "The fibre properties of cotton grown on rain-fed areas" (E. V. Sokurova-Visotskaya). II. "Annual and perennial forage crops under the conditions of artificial irrigation on cotton farms" (F. A. Sokolov and O. V. Sokurova-Visotskaya); "The question of joint and separate applications of stable manure and fertilizers for cotton" (E. A. Skrjabin); "Cultural practices as a means of control of soil alkalization and the present situation of the problem" (B. S. Kontov); "A contribution to the methods for introducing corrections for wide spacing" (A. M. Ananian).

105. AGRICULTURAL DEVELOPMENTS IN THE U.S.S.R. By Sir John Russell, F.R.S. (*Nature*, 6/11/43, p. 525.) An interesting paper dealing with the setting up of State Farms and, later, of Collective Farms in the U.S.S.R.

106. RUSSIA: BLACK COTTON. (*Sci. Suppl.*, **97**, 2509, 1943, p. 9. From *Pl. Bre. Abs.*, xiii, **4**, 1943, p. 345.) It is noted that the Russians have recently produced a new variety of cotton with black lint which is believed to be a faster colour than the black of dyed cotton.

107. UKRAINIAN COTTON: CHARACTERISTICS. By V. G. Shaposhnikov. (*Dopovidi Akad. Nauk. U.R.S.S.*, **2**, 1940. From *Summ. Curr. Lit.*, xxiii., **16/17**, 1943, p. 446.) Data are recorded in the original Russian paper on the chemical and physical properties of Ukrainian cotton, which is said to be of inferior quality.

108. SOUTH AMERICAN COTTON INDUSTRY: DEVELOPMENT. By M. E. Wambsganss. (*Text. Wkly.*, **32**, 1943. From *Summ. Curr. Lit.*, xxiii., **16/17**, 1943, p. 463.) The development of cotton growing and manufacturing industries in South America is

reviewed, and recent statistics given for Brazil, Peru, Argentina, Mexico, Chile, Paraguay, Colombia, Venezuela, Uruguay, Bolivia, Ecuador, El Salvador, Guatemala, Costa Rica, Nicaragua, Honduras, Cuba, and Haiti.

109. SYRIA: COTTON PRODUCTION, 1943. (*Cotton*, M/c, 4/12/43.) Approximately 14,000 hectares are reported to be devoted to cotton cultivation in 1943, compared with 12,000 hectares in the previous year (1 hectare=2·471 acres). Unusually low temperatures and heavy rainfall have adversely affected the yield, and the crop is estimated at some 2,500 metric tons, or from 10-15 per cent. below the 1942 harvest.

110. TURKEY: COTTON PRODUCTION. (*Cotton*, M/c, 12/2/44.) The 1943 cotton crop is reported to be more than 20 per cent. below that of 1942. It is claimed that prices have not kept pace with rising production costs, causing growers to reduce their plantings. Unfavourable weather conditions further reduced the crop.

SOILS, SOIL EROSION, AND MANURES.

111. FUNDAMENTALS OF SOIL SCIENCE. By C. E. Millar and L. M. Turk. (Chapman and Hall, London; John Wiley and Sons, New York, 1943. From *Exp. Sta. Rec.*, **89**, 5, 1943, p. 517.) The factors involved in fundamental soil properties are presented in simple terms which will extend the usefulness of the book to farmers and others. The various chapters of the book cover the following subjects: Soil development, classification of soils, physical and chemical properties of soils, soil reaction, lime and its use, soil moisture, soil organism—their relation to soils and soil productivity, soil organic matter, cover and green manure crops, farm manures, nutrient requirement of plants, fertilizers and fertilizer materials, fertilizer practices, soil fertility maintenance and productivity rating of soil, soils and agriculture of arid regions, irrigation, etc. A glossary of soil science terms is a feature of the book.

112. THE SOILS THAT SUPPORT US: AN INTRODUCTION TO THE STUDY OF SOILS AND THEIR USE BY MEN. By C. E. Kellogg. (Macmillan Co., New York, 1941. From *Exp. Sta. Rec.*, **88**, 4, 1943, p. 446.) This is a popular discussion in which " technical discussions and words have been avoided in order to deal with the main principles simply." Despite this avoidance of technicalities, however, much of the modern science of the soil is outlined for the general reader. The contents are arranged under the headings: In the first place, the building material for soils, life and the soil, the parts of a soil, the rains come and go, soils of little places and of big places, soils of the grasslands, soils of the desert, soils of the forested lands (temperate), soils of the forested lands (warm and tropical), men use the soil, soils for different crops, ploughing and digging, fertilizors and lime, control of water on the soil, when do soils " wear out " ?, planning the use of the soil, the soil and our future.

113. SOIL ANALYSIS. By G. W. Robinson. (*Chem. and Indus.*, **62**, 19, 1943. From *Trop. Agr.*, August, 1943, p. 145.) The author outlines the objects and methods of simple chemical analysis as applied to soil samples during the course of a soil survey, or procured for the purpose of advising farmers on manurial questions. He stresses the well-known but often forgotten fact that laboratory work alone is very inadequate, and that not only a wide knowledge of the practice of agriculture is needed, but also considerable experience of the soils and crops of an area is essential before the results of soil chemical analysis can be successfully applied to the problems of agricultural production.

114. SOIL AND PLANT ANALYSIS. By Dr. S. C. Piper. (A monograph from the Waite Agr. Res. Inst., Univ. of Adelaide, 1942. 15s. From *Nature*, 2/10/43, p. 370.) This is a book that the analyst will appreciate—namely, one in which he is not bewildered by an array of methods, but is presented with a selection recommended from considerable experience. The author has compiled his book along these lines, and all the methods, with a very few exceptions, are those in use at the Waite Agricultural Research Institute. Concise, and more important still, precise

working details are given with ample explanation and a wealth of guidance and help. In the first section, dealing with soils, the methods, both physical and chemical, are those that are useful in soil survey work and in the study of long-term factors affecting soil fertility. In the second section are presented methods for the determination of the inorganic constituents of plants which form a logical alternative to rapid soil methods and are a more reliable approach to the availability of soil minerals, especially those supplying trace elements. Full treatment is given to the subjects of hydrogen-ion concentration, mechanical analysis, single-value soil constants and exchangeable ions. The methods for the determination of the sesqui oxides, alkaline earths and alkalis contain just those essential details without which the analyst may find himself in difficulties. The chapter on wet and dry washing is a valuable contribution. To those concerned with plant analysis and to many others the determination of the trace elements will perhaps appeal most of all. Here an organic reagent, dithizone, plays the leading part in the scheme of inorganic analysis. It is used with much success in separating most of the inorganic elements. This book is an outstanding addition to those already written on the subject.

115. The Mineralogy of Soil Colloids. By G. Nagelschmidt. (*Tech. Commn. No.* 42. Imp. Bur. Soil Sci., Harpenden, England, 1944. Price 2s. 6d.) The introduction of new methods of research, chiefly of X-ray diffraction analysis, has brought considerable advances in our knowledge of soil colloids within the last 15 years. It has been shown that the bulk of many soil colloids is crystalline and composed of clay minerals, often accompanied by oxides or hydroxides of silicon, iron, or aluminium. The clay minerals themselves have been studied and their atomic arrangements and properties are now known to some extent. Certain general results begin to emerge which may assist us to interpret the processes of soil formation and thus aid soil classification, and it is to be hoped that further studies in this field will also give more detailed information about the many perplexing effects encountered in agricultural chemistry. A brief general account of the crystal structures of clay minerals is intended to enable the reader to appreciate the technique of mineralogical work on soil colloids which is described on pp. 4-10. The atomic arrangements and properties of the different constituents of soil colloids are next reviewed (pp. 11-22), an account is given of the formation and stability of clay minerals (pp. 22-23), and finally the results are summarized in relation to pedology and, as far as is at present possible, to agronomy.

116. Pore-Size Distribution as a Measure of Soil Structure. By M. B. Russell. (*Soil Sci. Soc. Amer. Proc.*, **6**, 1941, p. 108. From *Exp. Sta Rec.*, **89**, 2, 1943, p. 171.) A technique is presented whereby moisture desorption curves, which provide a simple method for measuring size distribution of soil pores, can be quickly and easily obtained. The author points out that while the characterization of soil porosity from desorption curves shows considerable promise of developing into a useful method for attacking problems of soil structure, care must be used in interpretation of the curves, and particular attention paid to adequate sampling.

117. Advantages and Problems related to the Field Study of Soil Development. By G. D. Smith (*Soil Sci. Soc. Amer. Proc.*, **6**, 1941, p. 78. From *Exp. Sta. Rec.*, **89**, 2, 1943, p. 169.) The contribution of the field worker to the knowledge of soil formation is discussed. Data are presented to illustrate the interdependence of the field and laboratory study of soil development.

118. The Influence of Environment on Soil Formation. By J. Thorp. (*Soil Sci. Soc. Amer. Proc.*, **6**, 1941, p. 39. From *Exp. Sta. Rec.*, **89**, 2, 1943, p. 169.) Differences in soils, corresponding to differences in geographical environment, are grouped in three orders. Soil differences of the first order are broad and zonal in character, and they correspond to differences in climate and organic life. The deserts, grasslands, forests, and tundras provide the geographical backgrounds for the zonal and associated intrazonal and azonal soils. Those of the second order are local in character and correspond to local differences and variations in four factors of the environment—parent rock, relief, age of the soil, and biological activity. Variations in parent rock can be grouped in catenas, families, or complexes. Grada-

tional variations from one rock to another lead to sequences of soil types if drainage conditions are uniform, or to sequences of catenas if drainage conditions are variable. Relief as a geographical factor in soil formation owes its importance to its effect on (1) the accumulation of soil moisture, (2) the rate of geological and accelerated erosion and deposition, and (3) the use of the soil by man and his influence on soil formation. The effects of time on soil formation are conditioned by climate and the kind of parent rock. The physiographical and the geological status of the landscape usually gives the best clue to the age of a soil, the oldest soils in terms of years occurring on ancient undissected peneplains. Most of the truly old soils of the world are intrazonal in character for this reason. Soil differences of the third order are those that owe their existence to man's activities. By his methods of cultivation he has converted zonal soils into intrazonal and azonal soils, and has initiated the transformation of intrazonal soils to zonal soils by the use of artificial drainage. He is responsible for the destruction of both infertile and fertile soils, but he can also claim credit for the enrichment of soils that would otherwise be infertile and unproductive.

119. RECENT ADVANCES IN SOIL PHYSICS. By E. W. Russell. (*Soils and Fertilizers*, vi., **2**, 1943. From *Trop. Agr.*, September, 1943, p. 165.) The studies reviewed include among others recent work on soil structure and soil cultivation.

120. SOIL-VOLUME CHANGES AND ACCOMPANYING MOISTURE AND PORE-SPACE RELATIONSHIPS. By C. W. Lauritzen and A. J. Stewart. (*Soil Sci. Soc. Amer. Proc.*, **6**, 1941, p. 113. From *Exp. Sta. Rec.*, **89**, 2, 1943, p. 170.) A method for measuring the shrinkage of soil is described, and is suggested as useful for obtaining an index of clay properties, structural conditions, and available water.

121. A METHOD FOR MEASURING THE PLANT RESIDUE FRAGMENTS OF THE SOIL. By T. M. McCalla *et al.* (*Soil Sci.*, **55**, 2, 1943, p. 159. From *Exp. Sta. Rec.*, **89**, 2, 1943, p. 170.) The plant residues were separated from the soil in three fractions: (1) The plant material greater than 3 mm. This was separated by passing the dry soil through a screen. (2) Material less than 3 mm. but greater than 0·4 mm. This fraction was obtained by wet-screening of the dispersed soil. (3) Material less than 0·4 mm. but retaining its cellular structure, a fraction which was determined by flotation in a tall glass tube to the walls of which the particles adhered as the liquid was lowered slowly. Each fraction was dried at 105° C. and weighed. Data to show the reliability of the method are prseented.

122. SOILS OF THE DECCAN CANALS: THE ALKALI SOILS, THEIR NATURE AND MANAGEMENT. By J. K. Basu and V. D. Tagare. (*Ind. J. Agr. Sci.*, April, 1943, p. 157.) Considerable work has been done in India on the reclamation of the alkali soils, but knowledge regarding their nature is still imperfect. This is mainly due to the lack of available data on the morphology of these soils and of a clear understanding of the pedogenic processes leading to their formation. It is difficult, therefore, to forecast the probable behaviour of the soils under different intensities of irrigation and cropping. In the present paper an attempt has been made to arrive at a rational system of management of these alkali soils based on a thorough study of their morphology and chemistry, coupled with field experimentation to follow the dynamics of soil changes under different systems of irrigation, manuring, cropping, and fallowing. Reclamation of badly alkaline soils by means of artificial methods has also been dealt with.

123. SOIL GROUPS AND SUB-GROUPS OF SOUTH AFRICA. By C. R. van der Merwe. (Dpt. Agr. and For., S. Afr. Chem. Ser. No. 165. Obtainable: Librarian, Div. of Chem. Services, Private Bag, Union Bldgs., Pretoria, S.A. Price 15s., post free.) Deals with Physical Features; Climate and Rainfall; Geology and Vegetation; Soils of the Semi-arid and Desert Region; Solonetzic Soils; Kalahari Desert Soils; Sub-tropical Black Clay Soils; Brown Forest Soils; Lithological Types; Podsolic Soils; Æolian Sandy Soils; Laterites: Soils of S.-W. and Southern Cape Province; Littoral Sandy Soils; Saline Soils in South Africa; Land Utilization of Soil Groups; etc. Each Soil Group has been considered as follows: Distribution; climatic conditions; topography, vegetation, geology; general description of the soils; description

of representative profiles; analytical results; mechanical and chemical composition of soils and chemical composition of the colloids; base exchange. References are given at the end of each chapter.

124. Erosion and Soil Conservation in the Union of South Africa. By J. P. van Aartsen. (*Mnthly. Bull. Agr. Sci. and Prac.*, Int. Inst. Agr., Rome, May, 1943.) The author describes first the environmental conditions in the South African subcontinent, which differ completely from those prevailing in the countries of the Northern Hemisphere while resembling those of Australia. The present condition of the country is largely accounted for by the history of its colonization, and a special chapter deals with this and similar problems showing how far economic factors are responsible for the present state of the country. In dealing with the forms of soil deterioration, water, and wind erosion, other questions such as the effects of veld burning are also treated. The author distinguishes between direct measures of erosion control (reclamation work, planting of cover crops, etc.) and preventive measures comprising the application of farming practices favourable to soil conservation. The Government of the Union has contributed liberally in this direction by granting assistance to individual landowners for reclamation work. An extensive programme for pasture research and veld management was inaugurated in 1934, and is being continued with the collaboration of the Experiment Stations.

125. Effect of Dolomitic Limestone on Soils and Crops when Used as a Neutralizing Agent in Complete Fertilizers. By E. R. Collins and J. J. Skinner. (*J. Amer. Soc. Agron.*, **34**, 10, 1942, p. 894. From *Exp. Sta. Rec.*, **88**, 4, 1943, p. 454.) Non-acid-forming fertilizers made with dolomitic limestone produced significantly higher yields of cotton, sweet potatoes, and Irish potatoes than were obtained with acid-forming fertilizers under coastal plain soil conditions in North Carolina. Neutralizing the fertilizer with dolomitic limestone maintained soil pH at approximately the original level, increased total magnesium in the plant and the available magnesium in the soil of the root zone, and increased total calcium in the plant with no appreciable change in the ultimate available calcium content of the soil or the potash content of the plant, indicating no appreciable liberation or fixation of the soil and fertilizer potash.

126. Effect of Lime and Fertilizer Treatments on Yield and Composition of Vetch and Yield of Cotton following Vetch. By C. D. Hoover. (*Soil Sci. Soc. Amer. Proc.*, **7**, 1942, p. 283. From *Exp. Sta. Rec.*, **90**, 1, 1944, p. 46.) In vetch fertilizer experiments, 1939-42, on Grenada silt loam, drilling lime and lime-fertilizer mixtures under hairy vetch was superior to ordinary planting methods. Vetches so treated produced N equivalent to 36 lb. per acre of commercial N as measured by cotton yields. Lime drilled into soils deficient in Ca might increase the N content of vetch as much as one-third as compared with unfertilized vetch. Vetch with a high N content decomposed faster than that low in N.

127. Improvement of the Nitrogen Status of Soil and the Origin of Soil Nitrogen. By N. R. Dhar. (*Nature*, 22/5/43, p. 590.) The author states that experimental results show that the loss of nitrogen, chiefly due to nitrification, when ammonium sulphate is added to the soil, is appreciably diminished by the addition of carbonaceous substances, which act as negative catalysts in the oxidation reactions involved in the process of nitrification, leading to a loss of nitrogen mainly in the gaseous state. . . . In temperate climates an attempt should be made to improve the available nitrogen by breaking the soil and exposing it to light and air in the spring, summer, or autumn when the sunlight is of high intensity. This will probably lead to an increase in the amount of ammonium salts and nitrate, but during the process of nitrification a certain amount of nitrogen may be lost in the gaseous state. This loss, however, may not affect appreciably the soil fertility because of the large amount of total nitrogen present in such soils. Loss due to the escape of free ammonia cannot be marked specially in temperate climates, in view of the fact that such soils have a tendency to be acidic. Instead of adding ammonium sulphate to soils in temperate countries to increase the available nitrogen, it may possibly be less expensive, especially under the present conditions, to increase the ploughing and

breaking up of the soil, making conditions more favourable for oxidation and nitrification, and obtaining a better crop yield without making the soils more acidic, as happens on the addition of ammonium sulphate. In the case of soils in temperate climates which have deteriorated and gone out of cultivation, it seems certain that the remedy lies in the addition of cow manure or other readily decomposable carbonaceous substance like molasses, hay, etc., rather than by the addition of legumes, which seem to have not much residual effect on solids. If a quick result is not expected, wasted or deteriorated land can be improved from the nitrogen point of view by covering it with vegetation or grass and leaving it undisturbed for a number of years. In this way the carbonaceous substances from the decaying vegetation are oxidized and assist in the fixation and conservation of soil nitrogen; thus the nitrogen status is improved.

128. APPLICATIONS OF NITROGENOUS MANURES TO COTTON. (*Trop. Agr.*, September, 1943, p. 181.) High yields of cotton have been reported as the result of applying sulphate of ammonia as manure for the cotton crop according to a special method (R. J. Kalamkar in *Nagpur Agr. Coll. Mag.*, **16**, No. 4.) This method consists in coating the cottonseed prior to sowing with dry sulphate of ammonia powder, the seed itself being moist with the wet paste of earth and cowdung, which is usually rubbed over it to paste down the fuzz and make the seed run freely through the drill. The method was compared with (i) applying the same dose of sulphate of ammonia as a top dressing 3 weeks after sowing, and (ii) applying one-half the dose by drilling it with the seed at sowing time and the other half as a top dressing 3 weeks after sowing, and (iii) control. The seed rate per acre was 20 lb., and the sulphate of ammonia used was at the rate of 10 lb. of nitrogen or the equivalent 50 lb. ammonium sulphate per acre. The trials were conducted at the Government Seed and Demonstration Farm at Khandwa, and the variety of cotton was V.434. The experimental plots were laid out in a randomized block with five replications. The results show that a very high and significant increase in yield was obtained by the method of coating the seed with the fertilizer, amounting to 66 per cent. over the control. The other two methods also gave increased yields of 14 to 18 per cent., but these increases were not statistically significant.

129. NITROGENOUS MANURING OF BLACK COTTON SOIL. By A. Sreenivasan. (*Nature*, 8/1/44, p. 55.) Rain-fed cotton is the principal money crop of the black soil tracts of India, which are often characterized by low yields and where nitrogen alone, among the three fertilizer elements nitrogen, phosphorus and potassium, has been found to be essential for increasing the yield. Groundnut cake, ammonium sulphate and farmyard manure or compost have all given significant responses, the expected increases in yield in pounds of seed cotton per acre per unit dose of nitrogen being $3{\cdot}79 \pm 0{\cdot}22$, $2{\cdot}24 \pm 0{\cdot}17$, and $1{\cdot}19 \pm 0{\cdot}17$ respectively. Humic manures are slow-acting and do not, in consequence, compare favourably with other nitrogenous manures and fertilizers, at any rate in their immediate effect. But the regular superiority of groundnut cake over ammonium sulphate, even on the immediate crop, and in spite of its slight but significant adverse effect on germination, was rather unexpected and warranted further examination. It has since been ascertained that application of groundnut cake and ammonium sulphate to the black, alkaline soil is followed by a certain amount of loss of ammonia, this loss being much more pronounced with ammonium sulphate than with the oilcake. It has been possible to measure, from time to time, the loss of gaseous ammonia *in situ* in field plots by a modification of the technique worked out by Subrahmanyan. Thus, in plots treated with ammonium sulphate and oilcake at 80 lb. nitrogen per acre, the average loss of ammonia from random spots, over a period of 52 days, amounted to 35 and 19 mgm. respectively, the corresponding loss from untreated plots being 12 mgm. In similar experiments carried out in the laboratory, from 12·6 to 24·2 per cent. of added nitrogen as ammonium sulphate could be accounted for through loss as gaseous ammonia during a period of a month, whereas, with groundnut cake under identical conditions, the loss of ammonia ranged only from 8·1 to 16·5 per cent. of the added nitrogen. It would follow, therefore, that a given rate

of application of ammonium sulphate would be less effective than its equivalent, on nitrogen basis, of groundnut cake by the extent of its increased loss of nitrogen as ammonia. An observation of interest was that loss of ammonia was considerably less where the ammonium sulphate or oilcake was drilled in furrows instead of being broadcast, as is usually the case; such drilling or application at lower depths below the surface was also followed by higher increases in yield. Loss of nitrogen from the soil through volatilization as ammonia has been noticed earlier, and would appear to be a general phenomenon with all tropical soils; indeed, under certain conditions, most of the nitrogen added as ammonium sulphate may be lost in this form within a fortnight. The high alkalinity (pH frequently greater than 9·0) and lime status (replaceable calcium about 40 M.E.) of the black soil would doubtless favour heavy losses of ammonium from this soil, especially with high concentrations of added ammoniacal fertilizers. For this soil, therefore, it is possible that calcium nitrate may prove superior to ammonium sulphate, as has been found to be the case in the Sudan.

130. The Availability of Phosphates. (*J. Soc. Chem. Indus.*, **59**, p. 678. From *Trop. Agr.*, June, 1943, p. 124.) The availability of the mineral phosphorus compounds in artificial manures is a matter of great importance. The mineral phosphate compounds in these manures and in mixed manures include mono-, di-, and tri-calcium phosphates, mono- and diammonium phosphates, magnesium ammonium phosphate, potassium phosphates, and others. Although many field comparisons have been made, chiefly between pulverized raw phosphates, superphosphates, and concentrated superphosphates, the research work on the economically and potentially important mineral phosphorus compounds is insufficient and inconclusive because it does not compare these compounds on a sufficient number of the important crops on the major soil types on which artificial manures are used freely. Economies in the transportation and handling of ammonium and potassium phosphates, and the possibilities of combining by-product ammonia with phosphorus at the coke ovens make apparent the importance of more extensive comparisons. It is desirable further to reduce or eliminate carrier elements of little value so that the definitely needed quantities of secondary and trace elements can be included without sacrificing concentration of the primary plant food elements. The variations in yields obtained when identical quantities of the same manure are applied by different methods, and particularly when manures in aqueous solution are applied either as "starter solutions" or as side applications, indicate that a considerable part of the experimental work should be conducted under field conditions, with related chemical studies of crops that take the larger part of the manure used in each important consuming area.

131. Utilization of Adsorbed Phosphate by Cotton and Oats. By R. Coleman. (*Soil Sci.*, **54**, 4, 1942, p. 237. From *Exp. Sta. Rec.*, **88**, 4, 1943, p. 453.) Cotton and oats supplied with a nutrient solution but with only that phosphate which had been adsorbed by the clay against acid and alkaline extracting solutions, grew well on relatively small quantities of adsorbed phosphate, whether it was held by the kaolinitic or the montmorillonitic clay, and the plants utilized a large percentage of the adsorbed phosphate present. Of the methods studied, Truog's was the most effective in removing the readily available phosphate from the clays, but it failed to remove much phosphate that was available to the plants.

132. Conservation of Humus in Tropical Soils. By A. Sreenivasan. (*Nature*, 13/11/43, p. 572.) The permanent manurial small plots at the Institute of Plant Industry, Indore, afforded an opportunity of studying the relative importance of humic manures and crop rotation on the conservation of soil properties. These sixteen plots have since 1933 been receiving annual surface dressings of farm compost, farmyard manure, and municipal compost, all at 10 tons per acre, and have been under a 4-year rotational cropping with (i) cotton, (ii) sann (*Crotalaria juncea*), ploughed in and followed by wheat, (iii) groundnut, and (iv) jowar (*Andropogon sorghum*), one set of four plots (including a control unmanured plot) being under a particular crop during a season. The plots treated with the different humic manures,

while yielding more or less alike from year to year with all the crops, had frequently given more than double the yields of the untreated plots. Surface (0-6 inches) and subsoil (6-12 inches) samples were taken from each of these plots during flowering time in October and examined individually in the laboratory, and some of the results obtained are discussed. . . . Humic manures are generally slow-acting and have, in consequence, a much higher residual effect as compared with the immediately available commercial fertilizers. With a deep-rooted crop such as cotton, therefore, their application may not be advisable if their full value is to be utilized. But if they are applied to a previous surface-rooted crop in the rotation they will not only benefit that crop but also have their characteristic effect on the deeper soil layers by the time the turn of the cotton crop comes. This fact has been fully borne out by the work at Indore, where (i) successive application of compost has given consistently high yields with cotton over a period of years, and (ii) in rotation experiments compost application to the previous crop has always benefited the succeeding cotton crop.

133. Occurrence of Soluble Selenium in Soils and its Availability to Plants. By O. E. Olson *et al.* (*Soil Sci.*, **54**, 1, 1942, p. 47. From *Exp. Sta. Rec.*, **88**, 3, 1943, p. 308.) Soils and plants from 32 locations within a small seleniferous area were analyzed for total selenium. Some of the soils were analyzed also for soluble selenium. The results indicate that in the region specified the second and possibly the third foot of soil are the important sources of selenium available to plants, and that the top foot of soil is, in general, relatively unimportant. Most of the soluble selenium was found to occur as selenates, but selenites appeared also to be present in the soils. The data obtained indicate that highly seleniferous soils may be formed by the removal of soluble selenium from seleniferous rock and its redeposition in materials of relatively low selenium content.

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, GINNING, ETC.

134. Methods and Purposes of Agricultural Surveys. By F. Yates. (*J. Roy. Soc. Arts*, **91**, 1943, p. 367. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 279.) A general account of the methods applicable to agricultural surveys is given together with a consideration of sampling errors and the need for further development in statistical analysis.

135. Sand Culture Methods. By F. M. Eaton. (*Chron. Bot.*, **7**, 5, 1942, p. 200. From *Exp. Sta. Rec.*, **88**, 3, 1943, p. 314.) A brief critical discussion of methods in the light of recent work by the author and others. (9 references.)

136. Cottonseed: Continuous Acid Delinting. Chemical Seed Treating and Delinting Corporation. (U.S.P. 2,308,883. From *Summ. Curr. Lit.*, xxiii., **13**, 1943, p. 340.) In a continuous process for delinting cottonseed the seed is passed through acid at a fixed temperature, drained, washed with water while in motion, and conveyed into a bath of water below its surface. The light material floats and the heavy seed is carried forward and dried by forcing hot air through it.

137. Plant Hormones: Effect on Cottonseed. By S. G. Lehman. (*Proc. Ann. Conv. Assoc. Sthn. Agr. Wkrs.*, **43**, 1942, p. 208. From *Summ. Curr. Lit.*, xxiii., **13**, 1943, p. 338.) Germination and yields of cotton were not improved by treating cottonseed with dust containing either indolebutyric acid or K naphthaleneacetate (1 : 113,000). Ceresan (1 : 160) also had no effect, but treatment with Spergon (1 : 480) gave increases in the number of seedlings and yield of cotton.

138. Cotton Plant: Nitrogen Deficiency. By I. M. Mal'tseva. (*Sbornik Nauch. Statei Komsomol'tsev, Soyuz NIKhI* (Tashkent), 1939, p. 167. From *Summ. Curr. Lit.*, xxiii., **22**, 1943, p. 572.) Experiments in sand cultures showed that if the nutrient medium contained only one-quarter of the normal nitrogen during the first period (before budding) or during the last period (during ripening) the yields did not

decrease. Decreasing the content of nitrogen in the nutrient mixture during the remaining periods of vegetation decreased the yield. The decrease of nitrogen in the mixture during the later stages of growth had a greater effect on the yield than did the decrease of nitrogen in the mixture during the earlier stages. A low nitrogen supply during one or more periods at the end of vegetation decreased the content of nitrogen in the stems, in the hulls, and in the leaves, compared with cotton plants grown on a complete nutrient mixture during the whole period of vegetation. A low nitrogen supply during the first half of vegetation resulted in the same nitrogen contents in the stems and leaves as were observed in plants grown on a complete nutrient mixture during the whole period, but the content of nitrogen was low in the cotton-forming organs.

139. GINNED COTTON: CONDITIONING. By R. M. Joyce. (Greenwille, Miss. U.S.P. 2,312,557. From *J. Text. Inst.*, August, 1943, A385.) Humidified air is conveyed into the stream of cotton emerging from the lint flue of the gin and the cotton is then baled.

MACHINERY.

140. COTTON HARVESTING MACHINERY: COSTING. By R. Garcia-Mata and R. A. Franchelli. (*Bol. Mens.* 93. Junta Nac. del Algodon, Argentina, 1943. From *J. Text. Inst.*, January, 1944, A3.) A report of tests with a mechanical harvester of the type having revolving teeth. Costs of mechanical harvesting are compared with those of hand picking, and the influence on costs of such factors as size of plantation, hours of use of the machine, and variety of cotton, is discussed. It is estimated that under typical Argentine conditions the cost of production per ton of cotton could be reduced by about 12·4 per cent. by the use of mechanical harvesting in place of hand picking. This would also solve the problem of the scarcity of labour available for cotton picking in the Republic.

141. COTTON DRIER FURNACE. (*Cotton*, M/c, 18/12/43.) What is described as a "war-time economy drier furnace" for drying cotton by direct heat from oil or gas has been developed by the U.S. Dept. of Agriculture engineers. The designer, Charles A. Bennett, of the Bureau of Plant Industry, Soils, and Agricultural Engineering, describes the new furnace as constructed of common brick on the outside with fire-brick lining the combustion space. A diesel oil burner is the source of heat. A filter of fine glass fibres which strains sparks and dirt from the hot gases is a protection against fire in the drying cotton. Since hot gases are used directly no boiler or steam pipes are needed, and a big saving in fuel is effected. The use of brick in construction also saves steel. By making the circulation system of the "blow-through" type, the engineers have gained the advantage of keeping the drier fan and its bearing cool, which simplifies lubrication.

142. COTTON GIN. Murray Co. (U.S.P. 2,315,140. From *J. Text. Inst.*, September, 1943, A430.) A cotton gin having a battery of saws with ginning ribs between them is combined with a huller rib assembly, the ribs of which are spaced from the ginning ribs so as to form an adjustable seed outlet channel from the roller box above the saws.

143. COTTON GIN PNEUMATIC CLEANING DEVICE. By M. A. Goldman and B. Lawrence. (*Text. Res.*, **13**, 7, 1943, p. 2. From *Summ. Curr. Lit.*, xxiii., **16/17**, 1943, p. 432.) Cotton fibre, undamaged and free from foreign matter, can now be obtained at the gin by the use of a machine attached to the lint duct in which cleaning is effected by the application of centrifugal force and high-velocity air currents. The machine condenses and delivers the fibre in a sliver about 1 inch in diameter, uniformly dense and with a very slight twist, coiled into a cylindrical container about 18 by 36 inches, and compressed to a density of 40-50 lb. per cu. ft. into a 250 lb. package. At the mill 50 of these cylindrical containers can be set up to make a blend from as many different cottons as desired, with the sliver from all of these containers combining, through a machine of the conventional sliver lapper or Derby doubler type, to make a lap for the feed of a single lapper section with a

Kirchner beater. The use of only one scutcher section is all that will be required to make any desired weight scutcher lap of uniform density. The use of the new machine at the gin will overcome objections to mechanically-picked cotton, reduce transport, storage and handling costs, and reduce opening, cleaning and subsequent processing requirements.

144. Pneumatic Cotton Sampling Apparatus. By G. E. Gauss *et al.* (U.S.P. 2,320,544. From *Summ. Curr. Lit.*, xxiii., **20**, 1943, p. 519.) A cotton lint flue has a duct tapped in at one side, sloping in the forward direction of travel of the lint and closed by an externally operated streamlined valve, and a to-and-fro adjustable baffle in the flue to deflect lint to the duct, in which it is condensed to a bat.

145. Cotton Gin Pneumatic Lint Cleaning Device. By P. E. Hopper. (U.S.P. 2,325,183. From *Summ. Curr. Lit.*, xxiv., **3**, 1944, p. 47.) The rail to which the gin ribs are secured has a passage for compressed air which is fed through ducts in the ribs into the roll box against the saws so as to remove trash from the lint on the saws.

146. Lint Cleaning Machine. By O. Sheppard. (Atlanta, Ga. U.S.P. 2,300,978. From *J. Text. Inst.*, June, 1943, A291.) A casing is divided by a partition into a lint-receiving chamber and a fan chamber. The partition has a lateral opening, at an intermediate height, which is substantially occluded by a roller in the receiving chamber. This roller is densely clothed with teeth and rotates towards the upper edge of the opening in the partition. The fan chamber is occupied by a drum with radial blades on its surface that come very close to the teeth on the above roller, rotating towards them. At the opposite side of the drum there is a suction conduit for the discharge of lint. Air is admitted at a region below the drum so that a current is created tangentially to the drum. Lint and trash are sucked centrifugally into the current and there classified, the clean lint passing out through the conduit.

147. Ginnery Lint Reclaiming Machine. By J. E. Mitchell Co. (U.S.P. 2,307,287. From *Summ. Curr. Lit.*, xxiii., **12**, 1943, p. 319.) A cotton extracting, cleaning, and reclaiming machine comprises an extracting cylinder, a cleaning chamber, a hull board that directs cotton from the chamber to the cylinder tangentially to its lower, rising side, and provides with this an opening for the escape of hulls, trash, and cotton locks not engaged by the cylinder teeth, a reclaiming saw below this opening for operating on escaping locks, and a doffer to remove reclaimed cotton from the saw and return it to the cleaning chamber.

148. Saw Gin Automatic Seed Roller Density Control Device. Indian Central Cotton Committee. (*Ind. Text. J.*, **53**, 1943, p. 169. From *Summ. Curr. Lit.*, xxiii., **16/17**, 1943, p. 423.) A brief notice of a system of reversing gears and a double electric relay that can be fitted to a saw gin to regulate the feed so that the density of the seed roller is automatically kept at a desired value.

149. Cotton Opening and Spinning Machinery: Developments. By W. A. Hunter. (Howard and Bullough, Ltd.) (*Text. Wkly.*, **32**, 1943, p. 856. From *J. Text. Inst.*, February, 1944, A49.) A report of an address and discussion on modern trends in cotton spinning, with special reference to the reduction in the number of blowroom and speed-frame processes. New machines, including the Shirley high-speed dust-extracting cage, are briefly mentioned.

150. Spinning Frame Drafting Mechanism. By British Cotton Industry Research Assen. and G. Dakin. (B.P. 554,584 of 18/4/42, 9/7/43. From *J. Text. Inst.*, October, 1943, A569.) A device for the control of textile fibres in drafting, which is interposed between rearward and forward pairs of drafting rollers on spinning machines where fibrous material is subjected to the process of drafting in such a manner as to extend such control into suitably close proximity to the forward pair of rollers, consists of a loose control member which co-acts with a conveying apron, the control member being so fashioned, disposed and constrained that during the drafting process it is capable of to-and-fro rotational and translational motions of limited range. The apron is arranged below the material and the control member above it. The length of the control member may be rather greater than the width

of the apron and the projecting ends may be constrained against suitable stops. The control member has its lower or operative face smoothly finished and shaped rearwardly to provide a smooth lead-in for the fibres coming from the rearward pair of rollers.

PESTS, DISEASES, AND INJURIES, AND THEIR CONTROL.

151. ENTOMA: A DIRECTORY OF INSECT PEST CONTROL. By C. C. Hamilton. (Editor.) (New Brunswick, N.J., Eastern Br. Amer. Ass. Econ. Ent., 1943. Price $1.00. From *Rev. App. Ent.*, xxxii., Ser. A, **3**, 1944, p. 77.) The fifth edition of this directory, which has been completely revised, includes, in addition to the information in earlier editions, lists of the officials of the United States Department of Agriculture and of American associations, societies, and dealers that may be of interest to entomologists and other biologists, with notes on the nature of the organizations.

[*Cf.* Abstr. **134**, Vol. XIX. of this Review.]

152. BIBLIOGRAPHY ON INSECT PEST RESISTANCE IN AGRICULTURAL PLANTS. (Imp. Bur. of Pl. Brdg. and Genetics, Cambs., 1943. 1s. 6d.) As plant breeding and genetics progress and the general standard of crop production and quality rises, the question of selection of types for their resistance to damage by insect pests advances more into the foreground in any programme for the improvement of agricultural crops and other economic plants. The trend of research is seen in the work conducted during recent years on the cotton plant which is attacked by jassids and various other pests. This publication assembles the available information on research already done in the field. It gives an up-to-date survey of recent findings and of the results of some of the earlier work on the subject of plant resistance to insect pests and nematodes, regarded from the point of view of the plant breeder and the geneticist. The sources drawn upon comprise publications from the British Commonwealth, U.S.A., Russia, and the main European countries, various South American countries, and Japan.

153. CHEMISTRY OF INSECTICIDES AND FUNGICIDES. By D. E. H. Frear. (D. Van Nostrand Co., Inc., N.Y., 1943. $4.00. From *Bull. Imp. Inst.*, xli., **3**, 1943, p. 193.) The book was written as the result of a graduate course on insecticides and fungicides which was organized by the author for chemists and biochemists who felt that the courses available did not stress sufficiently the rapidly growing field of chemical endeavour. Unfortunately, the author's aim is also the limiting factor of the volume, owing to the fact that no textbook can hope to keep pace with the advances being made in these two subjects. It must be said, however, that this compact treatise is the most complete work that we have yet seen, and the author deserves high praise for the manner in which he has so skilfully selected his facts from the mass of original papers and relevant critical discussions published throughout scientific literature. The subject-matter is divided into five sections: (*a*) stomach poisons or protective insecticides, (*b*) contact poisons or eradicant insecticides, (*c*) fungicides, (*d*) spray supplements and residue removal, and (*e*) analytical methods. The first three sections deal with the source, use, and chemistry of the materials at present in use as insecticides and fungicides. In section four, the author has collected together information which is an essential adjunct to the use of these materials, and the last section consists of a symposium of recognized methods of analysis. This excellent textbook can be recommended to all those who wish for reliable information on these important subjects.

154. NYASALAND: REPORT OF THE ENTOMOLOGIST, 1942. By C. Smee. (*Dpt. of Agr. Nyasaland*, 1943. In typescript. From *Rev. App. Ent.*, xxxi., Ser. A, **9**, 1943, p. 353.) There were few serious outbreaks of insect pests in Nyasaland in 1942. Only 2 of 450 larvæ of Lepidoptera other than *Diparopsis castanea* Hmps., collected on cotton in a large number of gardens, were those of *Platyedra gossypiella*, Saund., and only 2 pupæ and 10 larvæ of this moth, of which 8 were dead, were found in an

extensive examination of seed cotton in ginneries, no double seeds containing larvæ in diapause being observed. It is therefore concluded that under local conditions, and provided that the dead season between crops is rigorously enforced, *P. gossypiella* may be a minor pest of cotton as compared with *D. castanea* and *Dysdercus* spp. The restriction on the import of cotton lint from Nyasaland into the Union of South Africa, on account of the presence of *P. gossypiella*, was removed at the end of the year for saw-ginned baled lint of high density that had been harvested for more than 4 months.

155. WORK ON PEST CONTROL, 1941-42. (*Ann. Rpt. Dpt. Agr.*, 1941-42. Received 1943.) Mr. E. O. Pearson, the Corporation's Senior Entomologist in the Protectorate, reports that "research has been concentrated on the Red Bollworm and Stainer problems in the Lower River crop. Records have been maintained of insect populations and crop development and loss in sample gardens selected on the basis of a crop census in seven typical areas, with all relevant meteorological data. Experiments on time of planting of cotton and maize and their interaction, analyzed by taggings, were continued at the Chiromo sub-station. Pupation records were continued at several points and studies also made of pupal mortality. The relation of stainer breeding to eco-climate was investigated under field conditions and records instituted on wild host plants. These and previous years' observations suggest certain control measures, the choice amongst which hinges on the diapause problem in Red Bollworm. Investigations on the effect upon this of temperature and nutrition have commenced, the former involving the design and construction of much apparatus for temperature control, which has been successfully completed. At the end of the season a field and ginnery survey was carried out on behalf of the Department of Agriculture to determine the status of Pink Bollworm, the material collected being forwarded to the Government Entomologist for examination."

156. PERU: MEMORIA DE LA ESTACION EXPERIMENTAL AGRICOLA DE LA MOLINA, 1940. (*Rev. App. Ent.*, xxxi., Ser. A, **12**, 1943, p. 516.) *Cotton pests.* Reported by J. E. Wille. *Mescinia peruella*, Schaus, injured cotton bolls as in previous years, and *Heliothis virescens*, F., was again very harmful to cotton in the Cañete Valley. It is customary during the season to make up to 12 applications of an arsenical dust against *Heliothis*, beginning when 20 eggs per 100 plants are observed on the terminal shoots, but as infestation is patchy, this practice often leads to unnecessary treatment of large areas The excessive use of arsenicals results in outbreaks of *Aphis gossypii* and, furthermore, the poison is effective only against larvæ on young plants, on which the scarcity of bolls compels feeding on the leaves; 1 or 2 applications to the terminal shoots made by hand are sufficient to control the infestation at this stage. Once the larvæ have entered the buds and bolls treatment with arsenicals is of little use. *Dysdercus ruficollis*, L., suddenly increased, particularly in the neighbourhood of the wild malvaceous plant, *Sida paniculata*, owing to favourable weather and decreased parasitism by the Tachinids, *Acaulona peruviana*, Tns., and *Paraphorantha peruviana*, Tns. *Pinnaspis* (*Hemichionaspis*) *minor*, Mask., which was of no practical importance on cotton, was observed for the first time on *Abutilon cordatum*, and *Anthonomus vestitus*, Boh., on *Althæa rosea*. Up to 90 per cent. of the larvæ of this weevil on cotton in autumn and winter were parasitized by *Microbracon vestiticida*, Vier. *Anomis texana*, Ril., was again parasitized by *Blondelia* (*Eucelatoria*) *australis*, Tns., up to 80 per cent. of the larvæ being attacked in January. *Alabama argillacea*, Hb., and *Bucculatrix thurberiella*, Busck., were numerous in two valleys. *Aphis gossypiella* has increased in economic importance on cotton in recent years. It is normally numerous in two periods during the season, in spring (September-November) and in summer (February-March). In the spring outbreak, which begins on ratoon cotton, the aphids cause severe curling of the leaves and shoots. The summer outbreak, which is attributed to the destruction of natural enemies owing to the use of arsenical dusts, begins in the ratoon or planted cotton and results less in leaf curl than in abundance of honeydew, which covers the leaves, causing partial or total loss of foliage and a great reduction in crop. In 1940 the spring infestation was controlled by *Aphidius phorodontis*, Ashm., *Cycloneda san-*

guinea L., and *Scymnus* sp., but the summer outbreak caused injury that varied in severity with the frequency and rates of application of arsenicals. Where mixed dusts of sulphur and calcium arsenate (1 : 1 or 1 : 2) were applied, however, the aphid was less numerous and relatively well controlled by natural enemies. Larvæ of *Platyedra gossypiella*, Saund., were intercepted in cottonseed imported from São Paulo, Brazil, with an official certificate; the measures were suggested to guard against its introduction from Ecuador, where it has been found on cotton in the Province of Manabi. *Corythaica monacha*, Stal., caused serious losses in two valleys. An account is given of experiments on the effect on *Anomis texana* and *D. ruficollis* of adding selenium to the soil.

157. Cotton Insect Studies, South Carolina. By F. F. Bondy and C. F. Rainwater. (*55th Rpt. S. Car. Exp. Sta.*, 1941-42. From *Rev. App. Ent.*, xxiii., Ser. A, **2**, 1944, p. 58.) The results of investigations in South Carolina in 1937-42 on substitutes for calcium-arsenate dust for the control of the boll weevil, *Anthonomus grandis*, Boh., on cotton are given in a table and discussed. The dusts used comprised fixed nicotines, which showed no promise, synthetic cryolites, sodium fluosilicate, and barium fluosilicate. Practically all these were too heavy to give adequate coverage, and the results varied considerably from year to year. The yield from plots treated with the test materials compared more favourably than the infestation records with the corresponding data from plots dusted with calcium arsenate, since in some years infestation by Aphids (*Aphis gossypii*, Glov.) in the latter was severe; about as many aphids appeared on plots dusted with barium fluosilicate, however, as on those receiving calcium arsenate. Both fluosilicates were heavy and tended to pack, but this fault was counteracted to some extent by the addition of a small amount of buffering agent. Both caused some scorching of the foliage, and that due to sodium fluosilicate was severe in 1939, but it was found in 1942 that the addition to it of 10 per cent. soy-bean flour counteracted this tendency. Over the whole period, treatment with barium fluosilicate and cryolite resulted in 13·27 and 19·58 per cent. punctured squares, as compared with 10·59 for calcium arsenate, and these materials are regarded as showing some promise provided that their dusting qualities can be improved.

In experiments on the combined control of the boll weevil and *Aphis gossypii* no aphid injury occurred in plots dusted with calcium arsenate reinforced by enough ground cubé root to give 0·5 per cent. rotenone or by 1 per cent. nicotine.

158. Insects Injurious to Cotton in Tanganyika Territory. By W. V. Harris. (*Pamph. Dpt. Agr. Tanganyika*, No. 29, 1942. From *Rev. App. Ent.*, xxxi., Ser. A, **11**, 1943, p. 452.) The author gives a short account of the cultivation of cotton in Tanganyika, a list of 119 insects that feed on the crop, classified according to the part of the plant attacked, notes on the bionomics and importance of the more injurious of these, a map showing the areas in which cotton is grown, and climatographs of the coastal plain and the lake basin.

159. Tanganyika: Annual Report of the Entomologist, 1942. By W. V. Harris. (Typescript. Dpt. of Agr. Morogoro, Tanganyika, 1943. From *Rev. App. Ent.*, xxxi., Ser. A, **9**, 1943, p. 358.) In 1942 cotton in the Territory was damaged by aphids during the dry period between the rains; by jassids, of which *Empoasca facialis*, Jac., was widespread, and *E. benedettoi*, Paoli, was found only in small numbers; by the American bollworm (*Heliothis armigera*, Hb.) in areas in which maize was planted early, the pink bollworm (*Platyedra gossypiella*, Saund.), which increased rapidly in September, with consequent loss of the late crop, and the spiny bollworm (*Earias insulana*, Boisd.); and by stainers, of which the early population was mainly *Dysdercus intermedius*, Dist., *D. fasciatus*, Sign., appearing later, and *D. cardinalis*, Gerst., being locally numerous. *Helopeltis bergrothi*, Reut., was observed on garden shrubs and fruit trees early in the year, bred on cotton in May, and did much damage in restricted localities later.

160. Cotton Leafworm (*Alabama argillacea*): Effect on Cotton Quality. By E. Hixson and L. F. Bewick. (*Proc. Ann. Conv. Assoc. Sthn. Agr. Wkrs.*, **43**, 1942, p. 146. From *Summ. Curr. Lit.*, xxiii., **13**, 1943, p. 338.) Defoliation of the plant

by the leafworm does not harm the cotton or the seed except, possibly, while the bolls are less than 30 days old.

161. La Oruga de la Hoja del Algodonero, *Alabama argillacea*, Hubner, en Tucumán. By K. J. Hayward. (*Bol. Estac. Exp. Agr. Tucumán No.* 41. Tucumán, 1943. From *Rev. App. Ent.*, xxxii., Ser. A, **1**. 1944, p. 13.) *Alabama argillacea*, Hb., is one of the chief pests of cotton in the Province of Tucumán, Argentina. Its geographical distribution and bionomics are reviewed, and descriptions are given of all stages and the type of injury caused. In Tucumán the larval stage lasts about 12 days and the pupal stage about 8, and there may be up to 5 generations a year. Lists are given of 15 Dipterous and 16 Hymenopterous parasites recorded from *A. argillacea* in the province, as well as formulæ for preparing various arsenical sprays and dusts and instructions for their application. Traps baited with fruit pulp and juice poisoned with sodium fluosilicate, sodium fluoride or sodium arsenite may be used against the adults if they are injuring ripe fruit in orchards, but light and bait traps are not of much value otherwise.

162. The Araneida found on Cotton in Central Texas. By M. Kagan. (*Ann. Ent. Soc. Amer.*, **36**, 2, 1943, p. 257. From *Rev. App. Ent.*, xxxii., Ser. A, **2**, 1944, p. 42.) A list is given of 37 spiders taken on cotton in Central Texas during 1941-42, 9 of which were observed to feed on insect pests of cotton. The insects concerned were adults and nymphs of *Adelphocoris rapidus*, Say, and *Psallus seriatus*, Reut., nymphs of *Aphis gossypii*, Glov., and larvæ of *Heliothis armigera*, Hb., and *Alabama argillacea*, Hb. *Anthonomus grandis*, Bon., was not attacked.

163. Insecticide Tests for Cotton Aphid and Boll Weevil Control during 1941. By I. J. Becnel and E. H. Floyd. (*J. Econ. Ent.*, **35**, 5, 1942, p. 623. From *Exp. Sta. Rec.*, **88**, 4, 1943, p. 502.) Experiments conducted in two localities in Louisiana with calcium arsenate alone and with other materials to determine their effect upon the cotton aphid, the boll weevil, and upon the yield of seed cotton are reported, the results being analyzed statistically. The cotton aphid and boll weevil infestations were lowest on plats receiving calcium arsenate plus 1 per cent. nicotine, the average yield increase over the checks being 359 lb. seed cotton per acre; with calcium arsenate plus 10 per cent. sulphur and 0·5 per cent. rotenone 168 lb.; with calcium arsenate plus 10 per cent. sulphur and 0·2 per cent. pyrethrins 258 lb.; and with calcium arsenate alone 323 lb.

164. Insecticides to Control Bollworm, Boll Weevil, Cotton Aphid, and Cotton Flea Hopper. By K. P. Ewing and R. W. Moreland. (*J. Econ. Ent.*, **35**, 5, 1942, p. 626. From *Exp. Sta. Rec.*, **88**, 4, 1943, p. 501.) Basic copper arsenate mixed with sulphur or lime gave better control of bollworm and boll weevil than calcium arsenate, lead arsenate, or cryolite, and better control of cotton flea hopper than sulphur or sulphur-arsenical mixtures. The increase in aphids following dusting with basic copper arsenate and sulphur was less than half that following dusting with calcium arsenate or zinc-safened calcium arsenate. On cotton dusted with calcium arsenate there were 3·6 times as many aphids when 0·5 per cent. of rotenone was added as when 1 per cent. was included.

165. The Cotton Bollworms, *Earias fabia*, Stoll., *Platyedra gossypiella*, Saund., and *Heliothis obsoleta*, Fabr., in the Central Provinces and Berar. By G. R. Dutt *et al.* (*Ind. J. Agr. Sci.*, February, 1943, p. 1.) Observations carried out during 1934-37 indicated that the spotted bollworm (*Earias fabia*, Stoll.), pink bollworm (*Platyedra gossypiella*, Saund.), and American bollworm (*Heliothis obsoleta*, Fabr.) cause considerable injury to cotton in the Central Provinces and Berar. The life-history and habits of the bollworms, the nature and extent of damage caused by them, and the methods of carry-over in the crop are discussed, and some measures of control are recommended.

166. The Relative Effectiveness of Calcium Arsenates composed of Large and of Small Particles. By J. C. Gaines and H. A. Dean. (*J. Econ. Ent.*, **36**, 1, 1943, p. 76. From *Rev. App. Ent.*, xxxi., Ser. A, **10**, 1943, p. 398.) The authors describe field tests with dusts of commercial and special calcium arsenate, containing, respectively, 41·2-41·8 and 39·6 per cent. total arsenic pentoxide and 8·1-9·1

and 8·7 per cent. water-soluble arsenic pentoxide, and with mean surface particle diameters of 1·1 and 2·7 microns, and a mixture of the special calcium arsenate with sulphur and cubé (75 : 15 : 10) containing 29·1 and 3 per cent. total and water-soluble arsenic pentoxide and 0·34 per cent. rotenone. They were applied 11 times at the rate of 8-9 lb. per acre between June 24 and August 21 in Texas against *Anthonomus grandis*, Boh., and *Heliothis armigera*, Hb., on cotton, and 7 times at the rate of 6 lb. per acre between June 28 and August 9 in Louisiana against *A. grandis*. In both localities their effects on *Aphis gossypii*, Glov., and *Adelphocoris rapidus*, Say, were also observed. Infestation records made at intervals of 5-7 days showed that the two calcium arsenates were equally effective against the weevil and more effective than the mixture, but they led to a significant increase in the aphid population, whereas the mixture kept it at about the same level as on untreated plants. The commercial dust was most effective against the bollworm. The population of *Adelphocoris* was low, and only small differences occurred between treatments. The mixture gave the highest yield in Louisiana, owing to satisfactory aphid control, whereas the commercial calcium arsenate gave the highest yield in Texas, where aphids were not very injurious, because of good bollworm control. In laboratory tests in which known doses of the two calcium arsenates were given to about 100 fifth-instar larvæ of *Laphygma* (*Prodenia*) *eridania*, Cram., the coarser material was less effective than the finer one, the median lethal doses being 0·302 and 0·264 mg. per gm. respectively.

167. Se Decretaron Nuevas Medidas para Combatir el *Gorgojo pardo*. (*Bol. Mens.* 95. Junta Nac. del Algodon, Buenos Aires, Argentina, 1943.) Gives the text of a new decree, No. 145,386, of March 18, 1943, prescribing measures to prevent the spread of the cotton pest *Gorgojo pardo* (*Conotrachelus denieri*, Hust.) from infested areas in the departments of Pilcomayo and Pilagas in Formosa Territory to other parts of Argentina. By the decree all cottonseed in these departments must be disinfected immediately after ginning, exports from them of any non-disinfected cotton plants, or parts of plants, or products liable to be infected, are prohibited, and all material contravening these provisions must be burnt immediately.

168. Armyworm Habit of *Heliothis armigera*. By C. F. Rainwater. (*J. Econ. Ent.*, **35**, 6, 1942, p. 946. From *Rev. App. Ent.*, xxxi., Ser. A, **8**, 1943, p. 343.) In 1932 larvæ of *Heliothis armigera* became very abundant in vetch fields on three farms in South Carolina, and during the last week in May they migrated in thousands into neighbouring fields in the manner of armyworms. They caused severe damage to cotton, maize, soy beans, sweet potatoes, tobacco, and weeds in the line of march, and also attacked sugar-cane and ripening wheat, rye and oats. The vetch was not sufficiently defoliated to make movement in search of food necessary, but enormous numbers of larvæ had developed, as a result of which they came into direct contact with one another, which apparently stimulated movement, and many parasitic flies were present. The feeding and movement of the larvæ were apparently confined to the daytime, beginning at about 10 a.m. Furrows ploughed round the fields, with post holes at intervals of 4-6 ft., trapped practically all the marching larvæ. A moistened bait of 6 lb. wheat middlings, 4 oz. sodium arsenite and 1 U.S. pint molasses, spread in and near the furrows and applied on the leaves and in the buds of maize, was very effective, and dusting cotton and maize with calcium arsenate resulted in complete mortality within 24 hours. The infestation practically disappeared in about two weeks after it became noticeable, probably largely due to parasitism.

169. Natural Control of Eggs and First Instar Larvæ of *Heliothis obsoleta*. By R. K. Fletcher and F. L. Thomas. (*J. Econ. Ent.*, **36**, 4, 1943, p. 557. From *Exp. Sta. Rec.*, **90**, 2, 1944, p. 224.) A report of investigations of certain of the biological factors affecting the eggs and first instar larvæ of the bollworm, and their relative importance. The observations, the details of which are summarized in tables, relate to the natural control of the eggs and the first instar larvæ, the percentages of eggs and larvæ destroyed by various predators at College Station, Texas, and the possible survival of early stages in relation to oviposition and known hazards.

Assuming that all of the eggs and larvæ that were not known to be destroyed by predators or parasites hatched and completed development, it is concluded on the basis of these studies that not more than 61 per cent. of the eggs laid by the bollworm develop beyond the first instar under field conditions.

170. CONTROL OF HEMIPTEROUS COTTON INSECTS BY THE USE OF DUSTS. By J. R. Eyer and J. T. Medler. (*J. Econ. Ent.*, **35**, 5, 1942, p. 630. From *Exp. Sta. Rec.*, **88**, 4, 1943, p. 504.) Of the pentatomid and mirid plant bugs that injure cotton in the irrigated valleys of southern New Mexico, *Adelphocoris superbus* and species of the genera *Lygus* and *Chlorochroa* are the most important. In a block experiment conducted at State College in 1941 a substantial increase in the yield of cotton resulted from the use of dusts of Paris green and sulphur and calcium arsenate and sulphur. These arsenical-sulphur combinations also produced relatively high mortalities in the case of three species—*i.e.*, Say stinkbug, *L. hesperus*, and *A. superbus*—confined in large field cages.

171. *Horcius nobilellus* (*Berg*) (HEM. : MIR.) PRAGA DOS ALGODOAIS DO ESTADO DE S. PAULO. By H. F. G. Sauer. (*Arq. Inst. Biol.*, **13**, São Paulo, 1942, p. 29. From *Exp. Sta. Rec.*, **90**, 2, 1944, p. 224.) Investigations of the life-history, habits, and control of the mirid bug *H. nobilellus*, conducted in the State of São Paulo, Brazil, are reported. During the last 4 years this insect has caused severe losses in many cotton-fields extending over a rather wide area of the State. Its injury is manifested by excessive shedding of small squares, blossoms, and immature bolls, and the suppression of fruiting branches. Technical descriptions are given of the adult and immature stages. Cultural control measures are recommended. The application of sulphur or a mixture of 80 per cent. sulphur and 20 per cent. Paris green or 66 per cent. sulphur and 33 per cent. calcium arsenate, as a dust, gives effective control if used at the rate of 14-18 kilos per hectare (12·5-16 lb. per acre), and 4-5 applications at 8-10-day intervals are employed when the population of the plant bug begins to increase more than 8 per cent.

172. STUDIES ON THE COTTON JASSID (*Empoasca devastans* DISTANT) IN THE PUNJAB: EFFECT OF JASSID INFESTATION ON THE DEVELOPMENT AND FIBRE PROPERTIES OF THE COTTON PLANT. By M. Afzal *et al.* (*Ind. J. Agr. Sci.*, April, 1943, p. 192.) In the susceptible varieties studied, 38F and 289F/K.25, the mean fibre length of both was lowered significantly, while the mean fibre weight per unit length and percentage of mature fibres also recorded a reduction, though not statistically significant. In the resistant varieties, P-A 289F/43 and L.S.S., no significant deterioration was observed in any of the fibre characters studied, and hence in lint quality in general, in spite of a heavy infestation of jassids.

[*Cf.* Abstrs. **160**, Vol. XVIII. and **493**, Vol. XIX. of this Review.]

173. LA LUTTE CONTRE LES SAUTERELLES MIGRATRICES DANS LEURS AIRES GRÉGARIGÈNES. By H. J. Bredo. (*Servir*, Astrida, Ruanda, Belgian Congo, 1943. From *Rev. App. Ent.*, xxiii., Ser. A, **2**, 1944, p. 81.) This is a review of data on the phases of migratory locusts, the way in which their occurrence between outbreaks is restricted to special breeding areas, from which they migrate when a change of conditions causes them to assume the gregarious phase, and the possibility of preventing outbreaks by keeping the breeding areas under supervision and control by international organization, with particular reference to *Nomadacris septemfasciata*, Serv., and *Locusta migratoria migratorioides*, R. and F., the species of importance in the Belgian Congo.

174. OBSERVATIONS SUR LE COMPORTEMENT DU CRIQUET PÈLERIN (*Schistocerca gregaria* FORSK.) DANS LE SAHARA ALGERO-NIGÉRIEN. By M. Volkonsky. (*Arch. Inst. Pasteur Algérie*, **20**, 3, Algiers, 1942. From *Rev. App. Ent.*, xxxi., Ser. A, **12**, 1943, p. 521.) A summary of the author's observations on *Schistocerca gregaria*, Forsk., in the extensive area of the Sahara that includes the Southern Territories of Algeria and Tunisia, the north-east of the French Sudan and the north-west of the Colony of the Niger.

175. LA LAGARTA ROSADA (*Platyedra gossypiella*, SAUND.): LA PLAGA QUE MAS DAÑO CAUSA A LOS ALGODONALES ARGENTINOS. By R. G. Mallo. (*Alm. Minist.*

Agr. Argentina, **17**, Buenos Aires, 1942. From *Rev. App. Ent.*, xxxi., Ser. A, **12**, 1943, p. 476.) A brief account of the bionomics and control of *Platyedra gossypiella* (pink bollworm) on cotton in Argentina, where legislation was passed in 1939 and 1941 prescribing measures to be taken and recording as heavily infested the provinces of Corrientes and Santiago del Estero and the national territories of Chaco and Formosa.

176. Additional Notes on Host Plants of the Pink Bollworm in Texas and Mexico. By L. C. Fife and I. Moreno. (*J. Econ. Ent.*, **36**, 3, 1943, p. 478. From *Rev. App. Ent.*, xxiii., Ser. A, **2**, 1944, p. 57.) The authors discuss additional observations on *Hibiscus esculentus*, *Malvaviscus drummondi*, and *Pseudabutilon lozani* as food plants of *Platyedra gossypiella*, Saund., in the Lower Rio Grande Valley of Texas and Mexico. In addition they report that small numbers of larvæ were found in pods of *Abutilon trisulcatum* and buds and flowers of *H. syriacus*, but none were observed on many other malvaceous plants, including some that are known to be food plants elsewhere.

177. The Red Hairy Caterpillar and its Control. By H. S. Pruthi and M. S. Bebraw. (*Ind. Frmg.*, March, 1943, p. 135.) An account of the life-history and feeding habits, and the measures of control suggested for the red hairy caterpillar (*Amsacta moorei*, Butler), which in some years causes severe damage to cotton, maize, and other crops in the Pubjab.

178. Observations on Cotton Stainers (*Dysdercus* Spp.) and their Host Plants in Jamaica. By E. McCallan. (*Trop. Agr.*, June, 1943, p. 113.) The opinion is expressed that the successful cultivation of cotton in Jamaica would be dependent on the control of insect pests, especially the cotton stainers. Three species of stainer are common in the island—*Dysdercus andreæ*, *D. sanguinarius*, and *D. mimulus*; a fourth species may possibly occur, *D. suturellus*, but it is extremely rare. The most important stainer host plant is probably *Ceiba pentandra* (silk cotton tree), but other important woody hosts include *Ochroma pyramidale*, *Cola acuminata*, *Thespesia populnea*, *Hibiscus elatus*, and *H. tiliaceus*. In addition there are a number of malvaceous weeds which support large stainer populations, including *Sida acuta*, *S. rhombifolia*, *Urena lobata*, *Malvastrum coromandelianum*, and *Wissadula periplocifolia*.

179. Termites and the Fertility of Soils. By A. M. Adamson. (*Trop. Agr.*, xx., **6**, 1943, p. 107.) Discusses in some detail the mode of life of termites in relation to the soil, their feeding habits, the nature of their building materials, and factors in soil fertility which may be affected by their activities. Termites are earth-dwellers to a much greater degree than is generally recognized. In Trinidad very many of them appear to feed like earthworms by ingesting soil; there are few records of this habit from other countries, where little attention has been paid to it. The prodigious activities of termites must have a profound influence on soil, increasing its fertility in some ways but reducing it in others. The most important activities of termites affecting soil fertility are probably the consumption of dead wood and other plant remains, whereby the formation of humus and the cycle of mineral elements are accelerated, and the movement of soil above the surface for building nests and covered runways, and for lining or filling galleries in wood, thereby exposing soil to weathering and promoting its admixture with humus. Subterranean tunnels, which may extend through every cubic foot of soil to considerable depths, promote aeration, drainage and penetration of roots. Large termite mounds, when abandoned, may form soil of relatively high fertility, and soil carried high up on tree trunks and branches may favour the growth of certain epiphytic plants. In dry areas of sparse vegetation it is possible that the amount of organic matter in the soil may be seriously reduced by great numbers of termites feeding on plant remains, including humus already incorporated in the soil. This possibility does not seem to have been investigated. Harvester termites attacking live grasses denude parts of African velds, causing erosion. The accumulation of calcium carbonate in large mounds may result in deficiency of lime in the surrounding soil. Researches required to elucidate the relations between termites and soil fertility include quantitative in-

vestigations on the size of termite populations, the number and dimensions of mounds, the amount of earth brought above the surface, and the extent of subterranean tunnels. Few precise data on these subjects have been recorded. Much work is required also on the chemical composition of termite building materials and on their feeding habits, especially as regards organic matter in the soil.

180. Preliminary Notes on the Treatment of Australian Subterranean Termites in New Zealand. By K. M. Harrow. (*N.Z. Jour. Sci. Tech.*, **24.** 1B. Wellington, N.Z., 1943. From *Rev. App. Ent.*, xxxii., Ser. A, **1**, 1944, p. 29.) Describes the measures carried out for the control of *Coptotermes acinaciformis*, Frogg., *C. frenchi*, Hill, and *C. lacteus*, Frogg., under the Termites Act, 1940. These comprise thorough inspection of all wood at or below ground-level or connected with the ground, which will need to be continued for some time, owing to the difficulty of discovering colonies less than 4 years old, and treatment with arsenical dust blown into nests, galleries or runways containing active termites. The results are given of laboratory tests on *C. acinaciformis* to compare the toxicity of Paris green (average particle diameter 3·5 μ), white arsenic (19 μ) and lead arsenate. Workers were put in petri dishes containing the dusts, and after the dishes had been shaken to give them a good coating of the dusts, one was placed in each dish of a series containing 9, 24, 49, 74, 99 and 199 undusted workers; several of the dishes also contained soldiers, and all were provided with moistened filter paper on which the termites could feed. There was little difference in the time required to kill 10 or 200 individuals per dish with white arsenic, most workers being dead after 2 days and all after 3. A small proportion were still alive 3 days after treatment with Paris green, and individuals treated with lead arsenate died almost as slowly as untreated ones. Soldiers were not readily poisoned by the dust, but died of starvation and fungous attack in the absence of workers. In practice, the greater rapidity with which white arsenic kills does not necessarily make it more effective than Paris green, as in some cases it killed many of the termites passing through the treated runways before they could carry the poison back to the nest. Poisoning of *Coptotermes* was begun in February, 1941, and by September 146 infestations had been treated in Auckland and 5 in New Plymouth; nests that were examined after treatment showed very successful control, and in many more no recurrence of activity was observed after several months. Examples are given of a number of cases of field treatment with arsenical dust that show its effectiveness in New Zealand. It is concluded that the success of the control campaign in New Zealand depends on the completeness with which infestations are located, since it has been found that once a colony is discovered, eradication is readily effected with white arsenic or Paris green dusts blown into populated runways.

181. Textile Materials: Termite-Proofing. By A. Hase. (*Textilberichte*, **23**, 1942, p. 35. From *J. Text. Inst.*, September, 1943, A436.) The habits of termites are reviewed, and the problem of rendering textiles proof against these insects, which feed on cellulose, is discussed.

182. Host List of the Parasitic Fungi of Uganda. Pts. II and III. By C. G. Hansford. (*E. Afr. Agr. J.*, July, October, 1943, pp. 50, 102.)
[*Cf.* Abstr. **403**, Vol. XX. of this Review.]

183. Some Parasites of *Heliothis armigera*, Hbn., in Texas. By F. F. Bibby. (*J. Econ. Ent.*, **35**, 6, 1942. From *Rev. App. Ent.*, xxxi., Ser. A, **8**, 1943, p. 342.) Records are given of some parasites bred from *Heliothis armigera*, or observed attacking it in Texas, with notes on the dates of emergence of the parasites and the food-plants of the host in some cases. Those that emerged from pupæ comprised the Tachinids, *Archytas piliventris*, Wulp, *Achætoneura archippivora*, Will., and *Blondelia* (*Anetia*) *armigera*, Coq.; those reared from larvæ were the Tachinid, *Achætoneura frenchii*, Will; the Sarcophagids, *Sarcophaga latisterna*, Parker, *S. rapax*, Wlk., and *Hypopelta scrofa*, Aldr.; the Braconids, *Microbracon mellitor*, Say, *Microplitis croceipes*, Cress., *Iphiaulax* (*Monogonogastra*) *rugator*, Say, and *Zele melleus*, Cress.; the Eulophid, *Euplectrus comstocki*, How.; and the Ichneumonids, *Neopristomerus appalachianus* var. *dorsocastaneus*, Vier., and *Sagaritis provancheri*, D.T.; and

those from eggs were the Scelionid, *Telenomus heliothidis*, Ashm., and the Trichogrammatid, *Trichogramma minutum*, Ril. Adults of the Bethylid, *Perisierola cellularis*, Say, and an undetermined species or *Belyta* were observed attacking larvæ. The Sarcophagids were considered to be parasitic and not acting as scavengers, although the host of *Sarcophaga latisterna* was not found until it was dead.

184. *Podapolipus diander*, N.Sp., Acarien Hétérostygmate Parasite du Criquet Migrateur (*Locusta migratoria*, L.). By M. Volkonsky. (*Arch. Inst. Pasteur Algérie*, **18**, 3, 1940, p. 321. From *Rev. App. Ent.*, xxxi., Ser. A, **10**, 1943, p. 423.) Detailed descriptions are given of the first and second (adult) stages of the female, the internal anatomy of the adult female, and the two forms of the male of *Podapolipus diander*, sp.n., a Tarsonemid found as an external parasite on *Locusta migratoria*, L., in Algeria.

185. A Dictionary of the Fungi. By G. C. Ainsworth and G. R. Bisby. (Imp. Mycological Inst., Kew, Surrey, 1943, 20s. Reviewed *Pl. Bre. Abs.*, xiii., **1**, 1944, p. 84.) This book, written on the lines of Willis's "Dictionary of the Flowering Plants and Ferns," should prove of immense value both to student and research worker. In addition to generic names, synonyms, and the explanation of descriptive and technical terms, the authors have included many useful keys to the genera and families. Biographical notes on a few of the most important workers in the field of mycology are given, though one would have wished that more could have been included. The authors claim that the book is written almost entirely in Basic English, though they admit that it does contain a certain number of non-Basic words. On the whole, the style does not suffer through this, though there are perhaps a few ambiguities. The rather ugly use of brackets in the second paragraph of the prologue to the reader, whether due to Basic English or not, is to be deprecated. These, however, are only minor defects. If the book were for sale at about half the price indicated (20s.) its large amount of detailed information would make it the *vade mecum* of every mycologist. As it is, we doubt whether it will be seen and used by as many people as its high standard undoubtedly deserves.

186. De l'Absolu Nécessité d'une Nomenclature International des Bactéries. By P. Hauduroy. (*Chron. Bot.*, **7**, 7, 1943, p. 303. From *Exp. Sta. Rec.*, **89**, 4, 1943, p. 431.) The author calls attention to the present chaotic condition of bacterial nomenclature, and makes suggestions for bettering the situation. The subject is considered under two aspects—viz., the giving of precise names to bacteria, and the techniques and procedures for identifying them. . . . The development of an international system should involve the establishment of definite rules of nomenclature; the setting up and defining of the orders, families, and genera; the development of an experimental plan permitting the exact classification of an organism; a revision of bacterial species and their names; and the formation of an international collection of bacteria.

187. Fungicides: Evaluation. By H. Martin. (*J. Soc. Chem. Ind.*, **62**, 1943, p. 67. From *J. Text. Inst.*, September, 1943, A444.) Methods for the separate determination of factors determining fungicidal efficiency are reviewed. For some factors, such as distribution, tenacity, and stability, physico-chemical methods are possible; for others, such as fungicidal value, methods of bio-assay are required. The use of statistical methods in the interpretation of the bio-assay has thrown light not only on fungicidal value, but also on the mode of action and the chemistry of the fungicide. Examples of the application of these methods in the evaluation of sulphur and copper compounds and dithiocarbamates are discussed. It is pointed out that the summation of the results of the bio-assay and the physico-chemical methods permits a reliable prediction of the performance of the fungicide under practical conditions.

188. *Pythium ultimum* and the Damping-off of Cotton Seedlings. By C. H. Arndt. (*Phytopathology*, xxxiii., **7**, 1943, p. 607. From *Rev. App. Mycol.*, xxii., **12**, 1943, p. 478.) *Pythium ultimum* has been found to be a common agent of cotton seedling damping-off in sandy loam soil in South Carolina when planting is followed by cool, wet weather. In experiments in which Cleveland Big Boll seedlings from

acid-delinted, sterilized seed were grown in soil inoculated with a raisin-oatmeal agar culture of the fungus at temperatures of 18°, 21°, 24°, 27°, and 30° C., and a moisture content of 60 per cent., only slight infection occurred at 30°, but severe at lower temperatures, all the plants being killed at 21° and 18°. The results secured when the seedlings were grown for 6 or 12 days at 30° in infested soil and then transferred to 22° indicate that *P. ultimum* will cause heavy losses through damping-off only if conditions favouring infection develop before the host reaches a stage of maturity comparable to that attained in a growth period of 6 days at 30°.

189. COTTON SEEDLING DISEASES AND BOLL ROTS: DISTRIBUTION AND DISSEMINATION. By P. R. Miller and R. Weindling. (*Pl. Dis. Rptr., Suppl.* 141, 1943. Mimeographed. From *Rev. App. Mycol.*, xxii., **12**, 1943, p. 479.) A summary is given of surveys of cotton diseases conducted from 1938 to 1941 in 14 American States. *Glomerella gossypii* was recovered from 81·2 per cent. of the diseased seedling samples and from 67·8 per cent. of the bolls. It was widely distributed throughout the south-eastern states, but in Texas and Oklahoma its occurrence was limited to the eastern portions. The failure to find this fungus in the western Belt is attributed to unfavourable, dry conditions preventing its survival during the period between the damping-off and the boll-rot stages. Experiments conducted during the surveys showed that a simple relationship between climate and relative abundance of *G. gossypii* could not be established, the data indicating that in addition to rainfall other factors are important, such as availability of dead plant tissues and of shade provided by close stands. The fungus was found to survive the summer in Texas on the stems, leaves, and bracts of cotton plants; it is suggested that it did so in a quiescent form and that the unusually wet weather in the spring of 1941 provided better conditions for its persistence than in ordinary years. Latent infections of stems, leaves, and other organs of the cotton plant often occur in the eastern parts of the Cotton Belt, to be followed, when moisture conditions become favourable, by saprophytic development in rotting tissues, thus providing potential sources of inoculum for boll infection and seed infestation. In another set of experiments in South Carolina, contamination was carried over from infected trash to seed cotton in proportion to the spore load of the trash, and from severely contaminated seed samples to those ginned subsequently. It is concluded that contamination of seed in the gin accounts for much of the *Glomerella* damping-off of seedlings in the eastern part of the Cotton Belt, and that infected trash plays an important rôle in this process. In ginning tests with seed samples from South Carolina and Georgia (all containing *G. gossypii*), and from Oklahoma and Texas (all free from infection), it was found that after ginning the infected cotton, spores left on the ginning equipment caused sufficient contamination of the disease-free samples ginned subsequently to be detected by the spore-load determination method. The number, per seed, of spores of *Fusarium, Diplodia,* and *Alternaria* spp. was generally lower after ginning than before. When *G. gossypii*-contaminated seed was planted in 20 different localities, spore-load determinations, made on seed after ginning, showed that relatively high spore loads were present on seed from localities in the more humid belt—*e.g.*, coastal areas—and low loads on those from the inland sections of the eastern Cotton Belt where lower humidity prevails; no spores were found on seed from the sub-humid and semi-arid belt of Texas and Oklahoma.

190. VAPOUR ACTION OF CERTAIN FUNGICIDAL MATERIALS PREPARED FOR DUSTING COTTONSEED. By S. G. Lehman. (*Phytopathology*, **33**, 6, 1943, p. 431. From *Exp. Sta. Rec.*, **89**, 3, 1943, p. 325.) When cottonseeds were confined with vapours arising from Ceresan or New Improved Ceresan these condensed thereon in sufficient amounts to inhibit growth of such seed-infesting fungi as *Glomerella gossypii, Fusarium moniliforme,* and species of *Rhizopus, Aspergillus,* and *Cephalothecium.* Preparations containing ethyl mercury borate and ethyl mercury iodide were likewise effective. Mercurial vapours from these preparations were also lethal to *G. gossypii* conidia on filter paper or on mycelium in petri dishes and were retained for a considerable time after removal to the open air, but more tenaciously by the conidia than by the filter paper. The order of decreasing effectiveness was Ceresan, ethyl

mercury iodide, New Improved Ceresan, and ethyl mercury borate. Sanoseed gave good control when applied directly to the seed, but not as a vapour at 38° C. or lower. Because of the volatility of the two Ceresans (effective at 5°-38°) and their property of condensing and adhering to the seed, relatively small amounts are needed. Tests of Semesan, creosote dust, benzol, benzine, Para Bacca, and picric acid showed no inhibitory effect of their vapours on air-dry conidia of *G. gossypii*, but marked reduction or prevention of germination was effected by vapours of alkyl mercuric acetylene urea, Leytosan, 154-6B, chloropicrin, ethyl ether, and trioxymethane. Alkyl mercuric acetylene proved only partly effective as a fungicidal fumigant.

191. HISTOLOGICAL STUDIES OF INFECTIONS OF THE COTTON HYPOCOTYL BY *Glomerella gossypii* AND *Fusarium moniliforme*. By T. J. Harrold. (*Phytopathology*, xxxiii., **8**, 1943, p. 666. From *Rev. App. Mycol.*, xxiii., **1**, 1944, p. 15.) In inoculation experiments on College No. 1 cotton seedlings in water-agar cultures in petri dishes, *Glomerella gossypii* and *Fusarium moniliforme* (*Gibberella fujikuroi*) pursued similar courses in respect of penetration and mode of development in the host, both acting as intracellular parasites which eventually destroy the host cells. Features of infection by the two fungi include necrosis of the cortex and stele, enlargement of the hypocotyl above the side of invasion, and lateral flattening of the same region at the point of entry of the pathogens. There were, however, several differences between the effects induced by the two parasites. For instance, the hypocotyls attacked by *G. fujikuroi* attained a length of up to 5 inches, equal to that of the controls, while those in the *Glomerella gossypii* series reached only 1 inch; the former fungus produced less external mycelium than the latter; and the seedlings infected by *G. fujikuroi* commonly developed a whorl of lateral roots at the area of ingress, which may account for the stronger tendency to survival in the hosts of this organism than in those harbouring the agent of anthracnose.

192. MILDEWED COTTON FABRICS. By J. E. Goodavage. (*Amer. Dyes. Rptr.*, xxxii., **12**, 1943. From *Rev. App. Mycol.*, xxii., **12**, 1943, p. 479.) A semi-popular account of the structure and life-history of some of the principal agents of mildew in cotton fabrics, with special reference to conditions prevailing in the tropics, where damage to military clothing and equipment from this source is stated to constitute a major problem for the Philadelphia Quartermaster Depot. The author enumerates the fungicides used against textile mildews and describes three methods of applying them—*i.e.*, by an organic solvent, precipitation, and a single bath—and briefly discusses their relative merits. The most promising results were obtained with (*a*) a phenolic derivative, dihydroxy-dichlor-diphenylmethane, which combines toxicity to all types of moulds with absence of irritant properties, and (*b*) a mercury compound, phenyl mercury trinitriloethanol lactate.

193. MILDEWPROOFING TREATMENTS FOR TEXTILE FABRICS. By E. Green. (*Cotton*, Atlanta, cvii., **2**, 1943, p. 104. From *Rev. App. Mycol.*, xxii., **10**, 1943, p. 396.) This is a useful review of recent developments in the United States in connection with the treatment of textile fabrics for mildew prevention, with special reference to military requirements. Among the procedures described are those involving the use of copper naphthenate, ammonium fluoride, copper substitutes *e.g.*, zinc naphthenate and salicylanilide, phenolic substances, and certain water- and mildewproofing combinations in which the fungicidal element is usually supplied by copper stearate. Methods of testing the efficacy of the treatment by inoculation of the experimental fabrics with *Chætomium globosum*, or soil burial, are also discussed.

[*Cf.* previous abstract.]

194. BEHAVIOUR OF THE FUNGUS RHIZOCTONIA SOLANI KUHN IN THE SOIL. By I. D. Blair. (*Ann. Appl. Biol.*, **30**, 2, 1943, p. 118. From *Exp. Sta. Rec.*, **90**, 2, 1944, p. 202). This fungus was found to grow saprophytically through natural unsterilized soil. Studied by the Rossi-Cholodny soil-plate method, growth was most rapid at the lowest soil moisture tested (30 per cent. saturation) and was accelerated by forced aeration. The maximum distance to which mycelial growth through tubes of moist sand could be supported by the agar inoculum alone was about 5 cm., but in twenty-three days the fungus grew 21-24 cm. through tubes of soil. Removal of the

agar disc two days after inoculation of the tubes reduced the growth through sand by over half, through soil by only a small proportion. . . . The depressing effect of additions of 1 per cent. ground wheat straw or dried grass to the soil on growth of *Rhizoctonia* was attributed to the negligible cellulose-decomposing ability of this fungus, N starvation of its mycelium through competition with cellulose decomposers, and to the fungistatic action of the respiratory CO_2 produced by the latter.

195. A DESCRIPTION OF THE FUNGUS CAUSING COTTON RUST, AND A PRELIMINARY SURVEY OF ITS HOSTS. By J. T. Presley and C. J. King. (*Phytopathology*, xxxiii., **5**, 1943, p. 382. From *Rev. App. Mycol.*, xxii., **10**, 1943, p. 385.) The causal organism of cotton rust in Arizona and Texas, previously tentatively referred to *Puccinia boutelouæ*, has been found by G. B. Cummins to differ from that and all species heretofore described on *Bouteloua* in the presence in its uredospores of three equatorial pores instead of several scattered ones, and it is accordingly designated *P. stakmanii* n.sp. The fungus is characterized by amphigenous and caulicolous, punctiform, honey-yellow to cadmium-orange, later brownish, depressed, globose pycnidia, 90 to 120 μ in diameter, occurring in small, slightly raised, circular groups, with ostiolar filaments 60 to 100 μ long; cylindrical æcidia, 0·4 to 1 by 0·2 to 0·3 mm., surrounding the pycnidia in irregular groups; and orange, later yellowish or hyaline peridium, with a lacerate, recurved margin and quadratic or oblong cells, 17 to 30 by 11 to 20 μ, with a striate outer wall, 6 to 9 μ in thickness, and a strongly echinulate inner wall, 2·5 to 4 μ; globoid or broadly oblong æcidiospores, 18 to 25 by 13 to 19 μ, with very pale yellow to hyaline, finely verrucose walls, 2 to 5 μ thick; mostly epiphyllous, interveinal, oblong or linear, confluent, pale cinnamon-brown, pulverulent uredosori, 0·3 to several mm. in length; globoid to broadly ellipsoid uredospores, 25 to 27 by 18 to 22 μ, with a pale cinnamon-brown, moderately echinulate wall, 1·5 to 2·5 μ in thickness, with pores as mentioned above; amphigenous and caulicolous, rounded, elliptical or linear, confluent teleutosori, 0·3 to several mm. in length; and oblong or broadly ellipsoid teleutospores, 26 to 38 by 19 to 25 μ, with dark chestnut-brown walls, 4 to 9 μ thick at the apex, furnished with one septum, sometimes oblique or vertical, and a hyaline pedicel, two or three times the length of the spore. The pycnidial and æcidial stages are found in nature on the leaves and stems of *Gossypium barbadense* and *G. hirsutum*, and the uredo- and teleutosori on *B. rockrothii*. In greenhouse inoculation experiments all the cultivated cotton varieties represented in *G. barbadense*, *G. hirsutum*, and *G. hopi* were classed as susceptible, *G. arboreum* was mildly susceptible, 8 out of 10 wild cotton species were mildly susceptible and 1 susceptible, and 5 other Malvaceæ resistant. Four out of 5 species of *Bouteloua* tested were susceptible and 1 mildly so, while 8 species of *Muhlenbergia* and 9 of *Sporobolus* were resistant. In normal seasons the moderate amount of defoliation caused by *P. stakmanii* does not seriously impair the health of the plants, but the severe attacks coinciding with frequent rains and high relative humidity in the late summer or early autumn, such as occurred in Hidden Valley, Arizona, in 1940, may result in the shedding of most of the leaves and many of the bolls. Fields have been observed in which the incidence of infection reached 100 per cent. and more than half the effective leaf surface of the plants was destroyed or damaged. The alternate grass hosts of the rust in or on the borders of irrigated cotton plantations commonly grow much larger and produce more inoculum than the desert-grown specimens dependent on rainfall; hence some degree of control may be achieved by clean cultural practices, both within and along the borders of the fields.

[*Cf.* Abstr. **182**, Vol. XX. of this Review.]

196. PATHOGENICITY STUDIES WITH *Fusaria* ISOLATED FROM TOBACCO, SWEET POTATO, AND COTTON. By T. E. Smith and K. J. Shaw. (*Phytopathology*, **33**, 1943, p. 469. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 321.) It is shown that the pathogenicity of isolates of *Fusarium* section *Elegans* is not restricted to a single host species. The concept of physiological race is applied to these forms, and three such races, probably attributable to *F. oxysporum* Schl., are distinguished. The differential hosts are flue-cured tobacco, Burley tobacco, sweet potato, and cotton. Race 1 infects Burley tobacco and sweet potato; Race 2 both these plants and also flue-

cured tobacco; Race 3 Burley tobacco and cotton. Only one sample of *Fusarium* out of 94 failed to fit into this scheme—viz., an isolate infecting cotton but not Burley tobacco; this form may have lost its virulence owing to conditions under culture.

197. VARIETAL RESISTANCE TO THE FUSARIUM WILT DISEASE OF COTTON. By V. H. Young and L. M. Humphrey. See Abstract 230.

198. COTTONS RESISTANT TO WILT AND ROOT KNOT AND THE EFFECT OF POTASH FERTILIZER IN EAST TEXAS. By P. A. Young. See Abstract 91.

GENERAL BOTANY, BREEDING, ETC.

199. GREGOR MENDEL AND HIS WORK. By H. Iltis. (*Sci. Mo.*, **56**, 5, 1943, p. 414. From *Exp. Sta. Rec.*, **89**, 4, 1943, p. 431.) A review of Gregor Mendel's early surroundings and his contributions to the development of genetics through painstaking observations on the behaviour of individual characteristics in heredity.

200. GENES, SPECIES, VARIABILITY AND PLANT BREEDING. By O. E. White. (*Amer. Nat.*, **76**, 1942, p. 191. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 312.) The author's theme is the different degrees of variability shown by different species, genera, and families, and their importance to the plant breeder. Variability is rare in some of these groups; it is common in others; while some characters show great variability, others show little or none; some genes mutate easily, others appear never to change. These are some of the factors at the disposal of the plant breeder in his efforts to provide the most suitable variety for local conditions.

201. A DEVICE FOR VISUALIZING THE SOLUTION OF GENETICS PROBLEMS. By J. W. Hudson. (*Trans. Ill. Acad. Sci.*, **34**, 1941, p. 93. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 312.) An apparatus for demonstrating Mendelian inheritance by means of an adjustable combination of electric circuits is described. It is suggested that it would be useful for teaching purposes.

202. O PROBLEMA DA DELIMITAÇÃO E ORIGEM DAS ESPÉCIES DO PONTO DE VISTA DA BIOLOGIA EXPERIMENTAL. By A. Quintanilha. (*Rev. Agron. Lisboa*, **30**, 1942, p. 473. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 36.) The important part played by isolation in the formation of species is mentioned. In the Hymenomycetes incompatibility has been observed between haploids of different provenance.

203. ACCELERATING AND GUIDING PLANT EVOLUTION. By K. W. Neatby. (*C.S.T.A. Rev.*, **36**, 1943, p. 5. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 279.) An elementary account is given of the general cytological and genetical principles that are utilized in breeding economic plants. Segregation of characters during hybridization experiments is explained by simple analogies, and there is a brief mention of the usefulness of mutation and artificially-induced polyploids.

204. DOZE ANOS DE CITOLOGIA E GENETICA DOS FUNGOS. By A. Quintanilha. (*Agron. lusit.*, iii., **4**, 1941, p. 241. French summary. From *Rev. App. Mycol.*, xxii., **10**, 1943, p. 396.) This is a survey, accompanied by critical references to the relevant literature, of the studies carried out by the writer on the cytology and genetics of fungi during the 12 years since his initiation into the subject by Kniep in 1928.

205. INDORE INSTITUTE OF PLANT INDUSTRY: RESEARCH WORK, 1941-42. (*Ann. Rpt. Ind. Cent. Cott. Comm.*, 1941-42. Received 1943.) *Cotton Genetics.*—The study of the inter-relationships among the genes responsible for lintlessness in Asiatic cottons and the linkage relationships of these lintless genes to other known genes was continued during the year. F_2 populations of several crosses were under observation, and the analysis of the results has revealed that the two genes *lia* and *lic* are independent of each other, and that while both of them inhibit lint production, *lic* is epistatic to *lia*. The gene *lic* was found to slow down the growth of the plant carrying it and the gene *lia* to assort independently of the petal colour (*Y*) and anthocyanin (R_2) genes. Indication as to the independent assortment of *lib* gene with anthocyanin, flower colour and leaf shape genes was also obtained. The study of the cross, Punjab hairy lintless (*lic*) × Punjab glabrous lintless (*lib*), showed that

the *lic* gene, which is independent of *lia* and *lib*, is independent of *hb* also. A germination test, intended to collect evidence on the effect of environment on the viability of the seed carrying *lic* gene, was conducted with linted and lintless (*Lic* and *lic*) seeds under the following temperatures: 20° C. (room temperature), 30°, 40°, and 50° C. It was observed that while the percentage germination decreased with increasing temperature, there was no evidence of differential effect of the temperatures on the two types, but the mean germination percentage, however, of lintless seed (42·7) was significantly less than that of linted seed (62·3).

During the year progenies of certain aberrant plants that had occurred in the various F_2s and back-cross families and whose behaviour could not be explained were followed up. It was clear from the observations that the aberrant plants arose by mutation of the alleles of the R_2 series; in one case it was a mutation in F_1 gametes of R_2^{OS} to R_2^{AS}. In another case the mutation was from R_2^{GS} to R_2^{AS}; in a third case a mutation had occurred from R_2^{WO} to "green spotless." The behaviour of this "green spotless" isolated at Indore would appear to differ from the green spotless R_2^{FO} described by Silow, which has some pigment in the exposed petal margins.

Further results about the single leaf mutant were obtained. One of the F_2s of the cross between the mutant and Malvi 9 (broad leaf) gave 45 broads and 11 mutants, suggesting a single factor difference. Of the segregating families only two approached a 3 : 1 ratio. In all other families the mutant types were much fewer than the expected one-fourth, and the ratio between broad and mutant varied very widely with an average of 9·95 : 1. From a fresh batch of selfed seed of the F_2 plants an analysis of the embryos was made to see if any abnormal or undeveloped seeds appeared with regularity The study, however, showed that the abnormal ratios did not arise from the production of undeveloped embryos.

Seed of the petaloid mutant isolated in Coimbatore was obtained and crossed with N.6 and Narrow Kokati to determine the linkage relationships of the mutant. In the cross with N.6 the expression of petaloidy was very variable, and by the test of independence no linkage is evident between petaloidy and petal colour. Segregation for anthocyanin pigment also proved the independent assortment of petaloidy gene and anthocyanin genes. The absence of linkage was also established by a small number of back-crosses of the F_1 to the parents. In the other cross, the F_1s back-crossed to Narrow Kokati gave all normal flowers, showing complete dominance of normal over petaloidy. The behaviour of the petaloid gene differently in the two crosses would indicate that its dominance relationship varies according to the background.

It was reported previously that by X-raying seed of M.U.4, an Upland strain, there was an increase in ginning percentage and that this increase due to X-raying had proved significant in all the 3 years of trial, 1938-39 to 1940-41. During this period it was the treated bulks for 10 minutes and 20 minutes that were compared with the untreated control in a replicated experiment. Since there was the possibility of the M.U.4 strain itself being variable for ginning percentage, the experiment was modified during the year, and instead of growing the bulks, 10 progenies (single plants) taken from each of the treatments, A (control), B (X-rayed 10 minutes), and C (X-rayed 20 minutes), were grown in replicated family blocks. The effect of X-ray treatment was still significant, although the increase due to it was less than in the previous years, where the average increase was about 3 per cent.

Hybridization work was concentrated on three wild species: *G. Thurberi*, *G. Harknesii*, and *G. Raimondii*. *G. Thurberi* crosses freely both with *arboreum* and *hirsutum*, but while some of the seeds did not have embryos in the crosses with the former, in the cross with *hirsutum* all the seeds had well-developed embryos. A successful cross between *G. arboreum* and *G. Raimondii* was obtained for the first time. The use of colchicine for doubling chromosomes was continued in six or seven crosses, but bolls only set in two crosses: *G. taitense* × *G. hirsutum* and *G. armourianum* × *G. hirsutum*.

The experiment designed to study the competitive effects between *desi* and selected

Uplands (namely, M.9, M.U.4, Indore I, Buri 107 and X 4463) in a mixed crop was repeated for the last time. Unlike the previous year, Malvi 9 was significantly the lowest in stand, and pure Uplands plots of Buri 107 and Indore I, as well as their mixtures with Malvi 9, gave significantly higher stands than the rest. In yield of seed cotton M.9 was significantly the highest of all; among the pure Uplands, Indore I was significantly better than the other three. The results of the technological examination showed that Buri 107 and X4463 were nearly alike in having high fibre length and low fibre weight, and the latter when mixed with Malvi 9 gave a higher spinning value.

206. Indore Institute of Plant Industry: Progress Report of the Cotton Genetics Research Scheme, 1942-43. (*Pl. Bre. Abs.*, xiv., **1**, 1944, p. 12.) A few instances of simple dominance of naked seeds to fuzzy have been observed, but, in general, the progeny of crosses between these two types show continuous segregation for this character, several of the intermediate grades breeding true. It is assumed that fuzziness is determined by multiple factors. Crosses between 5-locular and 3-locular bolls have demonstrated that the former are simply recessive to the latter; 4-locular bolls occur occasionally in both these types. An analysis of the progeny of crosses between single leaf mutant and normal strains has confirmed the assumption that only 30 per cent. of the mutant gametes are functional. The character "red leaf" which exhibits a practically uniform red pigmentation on the upper leaf surface must be distinguished from "patchy red leaf," which is probably caused by jassid infection. "Red leaf" is determined genetically, and when crossed with normal types gives an F_2 segregation of red, intermediate and normal green forms in a ratio of 1 : 2 : 1. There is evidence that certain environmental factors may partially suppress the expression of this feature; it is associated with earliness and is not, on the whole, correlated with any disadvantageous character. It has been shown that "green spotless" (R_2^{oo}) is the basic recessive allele of the R_2 series. It segregates according to a 3 : 1 ratio when crossed with R_2^{os}. The latter gene differs from the anthocyanin gene of Tellapathi which determines pigmentation in the anthers. R_2^{os} is dominant to the Tellapathi gene in respect of anthocyanin characters. A single plant of Upland cotton, whose seed had received a 20-minute X-ray treatment, behaved outstandingly in progeny trials; it was superior to M.U.4 in yield, ginning percentage and lint length. Wilt resistance is still receiving much attention. A resistant strain of Malvi is not yet homozygous, and several wilt-resistant families have been found among the progeny of the following crosses: M1 × Jarila, M-0-20 × Jarila, and Million Dollar × Jarila. *G. anomalum* is very susceptible to wilt, and this defect was conveyed to all the progeny of the cross 4*n* (*G. anomalum* × K⁹) × *G. hirsutum*. Crosses between Bengal strains and varieties of *G. arboreum* exhibited heterosis for several quality characters. The correlation between earliness and various morphological features has been investigated and a statistical analysis made of the various components of yield. Regression coefficients were calculated between the number of bolls per plant, the number of seeds per boll, the weight of cotton per seed, and the ginning percentage. It was concluded that the most important character to select is the weight of cotton per seed.

207. Cotton Research Station, Trinidad: Summary of Work carried out during the 1942-43 Season. *Genetics Department.*—The season was wet, and consequently favoured the spread of soft rots and anthracnose disease. An epidemic of the latter in a batch of (Sea Island × U4) × U4 back-cross material showed up the occurrence of a number of predominantly U4 type plants carrying the anthracnose resistance of the Sea Island parent. It appears likely that resistance could be transferred from Sea Island to Upland cottons without difficulty. Developmental studies of leaf shape in the cotton plant have led to the initiation of developmental studies of crop production which it is hoped will lead to considerable improvement in the genetic analysis of commercially valuable characters. Studies of wild plants related to the cultivated cottons have yielded useful information on the way in which the true cottons originated. It has been shown that the important difference between the seed hairs of wild species and true lint is in the extent of the cellulose

thickening. It is evident that the reduction in cellulose deposition which gave rise to spinnable lint only occurred once in the history of cotton, and all the cottons of commerce are descended from that first linted stock. Examination of wild plants in related genera has brought to light the occurrence of true lint on the seeds of a wild Madagascar plant, and it appears that it has arisen in this case in the same way by the reduction in the amount of cellulose thickening. A mutant type from MSI Sea Island has recently been received in which the process has been reversed, and the seed hairs are fully thickened, as in wild species.

Physiology Department.—The chief interest in the past year has been in the factors controlling the water content of the leaf. We can experimentally increase the water content in a number of ways, one way being by increasing the salt content. Using the disc technique, we have caused the water content to increase more than three-fold as a result of increased salt content. An interesting feature of the salt effect is that it only becomes apparent in darkness. This is exactly the reverse of salt accumulation, which takes place only in light. Thus, discs floating on salt solutions take up salt by day and water by night. When discs are taken off salt solutions and put on water in the dark, the action of the salt in causing water uptake persists for some days. Many plants differ from cotton in that while the leaves can accumulate salt they do not show any concomitant water uptake. This work is throwing light on the nature of salt injury to cotton plants. Such injury appears to be due to the swelling resulting from salt rather than to salt itself. High salt concentrations in the leaf do not appear to be particularly injurious, although they do tend to reduce photosynthesis, but the swelling which may result from such salt is very injurious and results in yellowing and early death of the leaf.

Work on the differences in plant growth caused by differences in the level of nutrient supply has been extended to include the effects of climate in relation to nutrient supply. This work, which has as its primary object the elaboration of methods for diagnosing manurial deficiencies by rapid chemical methods, has served to emphasize the important part which weather conditions play in determining fertilizer response. Potassium is more effective in moist shade than under dry and sunny conditions, while for nitrogen the reverse holds. It was found, in one experiment, that an increase in nitrogen supply, which gave a marked increase in yield under dry, sunny conditions, actually caused a marked drop in yield under shade. The peculiar effectiveness of nitrogen under bright, dry conditions appears to be due to its effect in increasing water stability; this may explain the use of nitrogenous fertilizers under desert conditions, as in the Punjab and in the Sudan. It may also be the reason why the Punjab "tirak," which is reported to be a water-deficiency trouble, can be avoided by the use of nitrogenous fertilizers.

The vertical gradient of potassium in the leaves of a plant appears to be a delicate indicator of the nutritional status of potassium in the plant. The nitrogen content of the leaves appears to be the best indicator of nitrogen status so far found, while no adequate method for phosphorus has as yet been developed.

208. Isolation by Distance. By S. Wright. (*Genetics*, **28**, 1943, p. 114. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 312.) The theory that considerable genetic differentiation can arise in a continuous population through the effect of distance is developed mathematically.

209. Phenogenetic Evidence for the Amphidiploid Origin of New World Cottons. By S. G. Stephens. (*Nature*, 8/1/44, p. 53.) The genus Gossypium may be divided cytologically into four main groups:

(1) Asiatic diploids	($n = 13$)
(2) American diploids	($n = 13$)
(3) Australian diploids	($n = 13$)
(4) New World "tetraploids"	($n = 26$)

Cytological evidence suggests strongly that New World cottons have been evolved by amphidiploidy from hybrids between Asiatic and American diploid cottons. It is supported by artificial syntheses of amphidiploids which produce partly fertile

hybrids when crossed with New World types. Phenogenetic evidence leading to the same conclusion is presented in the article.

Reference is made in the article to a paper on the subject which will appear shortly in the *Journal of Genetics*.

210. THE HANDLING OF CHROMOSOMES. By C. D. Darlington and L. F. LaCour. (George Allen and Unwin, London, 1942. From *Exp. Sta. Rec.*, **88**, 5, 1943, p. 607.) This book aims to cover all the steps in handling chromosomes, "from dissecting the first animal or plant to drawing the last diagram," in order to serve teachers, students, and workers in research. The 12 chapters take up origin, scope, and purpose of chromosome work, equipment, living chromosomes, bulk fixation, smears and squashes, paraffin methods, staining and mounting, special treatments, the control of mitosis, the control of fertilization, photography, and describing the results. Appendices give sources of material and standard solutions. References (over 25 pages) and an author-subject index are included.

211. A HANDBOOK OF PLANT TISSUE CULTURE. By P. R. White. (Jaques Cattell Press, Lancaster, Pa., 1943. From *Exp. Sta. Rec.*, **89**, 6, 1943, p. 643.) This handbook was planned "as an aid to those who may actually make use of the technique —students, investigators in other fields for whom the methods presented may be useful in the solution of their own problems, and perhaps a very few who may approach the subject for its own sake." An introductory chapter emphasizes the importance of morphogenesis, out of the study of which the tissue culture method was evolved. Then follow an historical sketch of four periods of its development, with portraits of leading investigators; a discussion of the material which may be successfully used; detailed descriptions of the kind of laboratory needed, the nutrients used, and how cultures are started and kept going; and a consideration of growth measurements and their interpretation. The final two chapters call special attention to the important rôle which the method may play in solving biological problems. The bibliography contains 457 references, and an author-subject index is provided.

212. METHODS IN PLANT BREEDING. By V. G. Panse. (*Ind. J. Genet. Pl. Breed.*, **2**, 1942, p. 151. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 4.) The use of statistical methods in plant breeding is justified in reply to those who regard selection by individual intuition as the most fundamental element of successful breeding.

213. IMPORTANCE OF PHYSIOLOGICAL STUDIES IN MODERN PLANT BREEDING. By D. S. Ranga Rau. (*Poona Agr. Coll. Mag.*, **34**, 1942, p. 123. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 5.) The importance of physiological studies in plant breeding is discussed with special reference to the following topics: yield, frost resistance, drought resistance, vernalization, photoperiodism, local adaptation, resistance to disease, earliness, floral biology and dormancy.

214. DETERIORATION OF VARIETIES OF CROPS AND THE TASK OF THE PLANT BREEDER. By B. S. Kadam. (*Ind. J. Genet. Pl. Breed.*, **2**, 1942, p. 159. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 5.) The various cases of crop deterioration are classified and discussed as follows: An unfavourable environment may cause a variety to develop poorly and create an impression of deterioration; mechanical mixing of seed gives rise to a mixed crop, which is then subject to the competitive effect of the contaminant; unfavourable mutations are liable to arise and, if left unrogued, will lead eventually to an inferior stock; natural hybridization with other varieties, either wild or cultivated, will destroy the purity of a variety; most varieties, on release, still contain a considerable reserve of small variations, and these may interact in such a way that the less desirable characters are favoured by natural selection; the continually changing proportions of the physiological races of organisms which give rise to diseases may lead to the increase of more virulent forms, and as a consequence crop varieties believed to be resistant will become susceptible and give an incorrect impression of genetic deterioration; faulty technique on the part of the plant breeder may result in the release of insufficiently stabilized varieties or varieties unadapted to local conditions.

215. A SELEÇÃO INDIVIDUAL NO MELHORAMENTO DO ALGODOEIRO. By R. G. Martins. (*Bol. Minist. Agr.*, **28**, Rio de Janeiro, 1939, p. 47. From *Pl. Bre. Abs.*,

xiv., **1**, 1944, p. 60.) The technique of artificial selection used in cotton breeding is described. Earliness, vigour, yield, and disease resistance are the characters on which field selection is based, boll size and weight, lint percentage, length and index, and seed weight being determined in the laboratory. Selection is always carried out in the locality for which the new varieties are designed.

216. COMPETITION IN COTTON VARIETY TESTS. By T. R. Richmond. (*J. Amer. Soc. Agron.*, **35**, 1943, p. 606. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 60.) An appreciable degree of competition has been demonstrated between cotton varieties laid out in field tests. Generally speaking, the highest yielding varieties competed most strongly, and plants growing in outside rows outyielded those of the same variety in the inside rows.

217. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The twentieth number of Series A, Genetics, has recently been published, and contains the following paper, reprinted from the *Empire Journal of Experimental Agriculture*, vol. xi., **43-44**, 1943:

THE EFFICIENCY OF PROGENY-ROW BREEDING IN COTTON IMPROVEMENT. By J. B. Hutchinson and H. L. Manning. The breeding history of the superfine Sea Island cotton V.135 is described, and the achievements of selection evaluated from a comparison between modern strains of the variety and a representative of the 1920 stock. It is shown that the modern strains carry no appreciable genetic variance and, as would be expected, there has been no response to selection in them. Improvement was considerable in the earlier years, and evidence is presented to show that at that time there was considerable genetic variance in the variety. The response to selection attainable in pedigree material of suitable genetic constitution is illustrated by data on the breeding history of U.4 cotton, and it is concluded that all available information supports the view that the capacity to respond to selection is a function of the genetic variance of the material. The advantage of progeny-row breeding over mass selection is considered. Its chief merit is that the ratio of the genetic to the environmental variance is very much greater between progeny means than between plants of a mixed population of the same genetic constitution. Selection on progeny means is m times as efficient as mass selection in the same material, where m is the number of plants per progeny. Factors governing the efficiency of a breeding programme are considered, and it is shown that a well-designed progeny-row breeding programme will yield the information the breeder requires.

218. THE EFFECTS OF l-PROLINE ON PROLIFERATION OF CELLS AND DIFFERENTIATION OF PROTOXYLEM IN ROOTS OF COTTON AND BEAN. By E. S. Barghoorn, Jr. (*Growth*, **6**, 1, 1942, p. 23. From *Exp. Sta. Rec.*, **88**, 4, 1943, p. 463.) In cultured cotton seedlings and excised bean root tips, 5/100,000 M and 2/100,000 M concentrations of proline tended to retard root growth in length, whereas 1/100,000 M had no apparent influence. There was some evidence that this retarding effect is roughly proportional to the molecular concentration of proline in solution. No clear-cut evidence was obtained to show a specific effect of proline on the rate of protoxylem differentiation. Possible traumatic effects in excised roots must be considered in any conclusions drawn from such material.

219. THE EFFECT OF RINGING AND TRANSPIRATION ON MINERAL UPTAKE. By F. C. Steward. (*Ann. Bot.*, n.ser. **7**, 25. London, 1943. From *Exp. Sta. Rec.*, **89**, 4, 1943, p. 426.) A criticism of the paper by Phillis and Mason.

[*Cf.* Abstr. 220, Vol. XVIII. of this Review.]

220. THE APPLICATION OF SUPPLEMENTARY ARTIFICIAL POLLINATION TO AGRICULTURAL CROPS. By A. C. Musiiko. (Pan-Soviet Lenin Acad. Agr. Sci., Moscow, 1941. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 318.) Supplementary artificial pollination—a new method in scientific farming—occupies a most important place amongst the measures employed to ensure a good yield of maize, sunflower, hemp, lucerne, and many other cross-pollinated crops. All of these have shown a big increase in yield where the new method has been used. Tabular data are given to illustrate this, and the methods of carrying out the operation are described.

221. THE PRINCIPLES OF PHYTOPATHOLOGICAL ASSAY IN SELECTION. By E. E. Gešele. (Ogiz, Selhozgiz, Moscow, 1941. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 320.) In this monograph an attempt has been made to throw more light on the susceptibility and resistance of plants to infection caused by the rust and smut fungi, bacteria, and by some of the other parasites of the flowering plants; at the same time the author gives, in the light of his own experiences, the basic principles by which the grower should be guided in utilizing for the purposes of selection the disease resistance, which is apparently an hereditary character, of economically important plants. The biological specialization of causal organisms of infection, their apparent preference for attacking one genus, species or variety, reflects their selective affinity or need for a particular kind of food as provided by the hosts. The variety gradations of susceptibility, disease resistance and immunity arise from and may be explained by the degree of biological adaptation existing between the infective agent and the host plant. Although the use of international collections of differential hosts may be of value in the work of selecting this or that variety resistant or immune to a number of biotypes of the parasite, the author deems it expedient to introduce a new concept, isoreagent, denoting a group of races all giving the same reaction with regard to the particular varieties actually cultivated in any given region. Discussing different degrees of susceptibility and resistance, the author traces the direct causal connection between the "infectious background" (meaning by this such conditions favouring the onset of disease as monoculture, short rotation, etc.) and the "infective load or charge"—that is, a quantitative variation of the infective agent needed to produce a partial or mass outbreak of the disease in natural or artificial infection. Three chapters of the book are devoted to the technique of testing and to the critical survey of the methods of phytopathological determinations as an aid in selection. As may be seen from the number of references cited, the author draws freely upon the Russian and foreign literature on the subject, concentrating, however, on the practical application in conditions of the Steppe-Forest zone in the Southern U.S.S.R. Hybridization is recognized as the principal means of revealing the correlation, on the genetical plane, between the polymery of the host reaction and the parasitic biotypes on the one hand and the heightening of the disease resistance on the other. A differential scale of appraisal—presumably useful in Russian conditions—in different stages of selection as related to the "infectious background" is given in the concluding chapter of the monograph.

222. LEAF CURL INFECTED COTTON PLANT: PHYSIOLOGY. By L. K. Kar-Murza. (*Pl. Virus Dis. and their Control, Trans. Conf. Pl. Vir. Dis. Acad. Sci. U.S.S.R., Inst. Microbiol.*, 1941, p. 197. From *Summ. Curr. Lit.*, xxiii., **20**, 1943, p. 529.) In leaves infected with virus the total nitrogen and protein nitrogen are low. The carbohydrate content, especially starch, increases. There is a low carbohydrate content in the reproductive parts and bark of the stem of infected plants. There is less chlorophyll in leaves of plants infected with virus than in healthy plants.

223. A NOTE ON THE GROWTH BEHAVIOUR OF COTTON BOLLS. By D. B. Anderson and T. Kerr. (*Pl. Phys.*, **18**, 2, 1943, p. 261. From *Exp. Sta. Rec.*, **89**, 6, 1943, p. 662.) Daily and seasonal variations in the diameters of cotton bolls of the Rowden, Half-and-Half, Coker 100, Cook, and D. and P.L. varieties of Upland cotton were recorded during the summers of 1940-42. Enlargement of young bolls was not inhibited by severe wilting of the parent plant. Full-sized bolls shrank in size when the parent plants were visibly wilted, and regained their size during the night if low soil moisture was not a limiting factor. Degree of shrinkage of full-sized bolls was, in general, proportional to the severity of wilting of the parent plant. During periods of severe drought, shrinkage occurred later in the day and recovery during the night was partial or even entirely absent.

224. INFLUENCE OF VARIETAL DIFFERENCES ON THE GRADE OF COTTON. By H. B. Brown and C. H. Haddon. (*J. Amer. Soc. Agron.*, **35**, 1943, p. 249. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 346.) The results of experiments are tabulated to show the effect of the variety on the grade of lint in cotton. Among the six varieties studied

there was a significant difference of half a grade between the value for the highest and the lowest varieties.

225. STUDIES ON THE PUNJAB HAIRY LINTLESS COTTON MUTANT. K. Ramiah and S. R. Kaiwar. (*Ind. J. Genet. Pl. Breed.*, **2**, 1942, p. 98. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 13.) The multiple effects of the gene pair, *Lic, lic*, have been investigated with reference to the following characters: total height, internodal length, number of nodes, growth rate, development of the testa, leaf shape, boll and seed characters, and seed viability. It is concluded that the mode of action of the genes considered is a genuine case of pleiotropism.

226. INHERITANCE OF GREEN FUZZ, FIBRE LENGTH, AND FIBRE LENGTH UNIFORMITY IN UPLAND COTTON. By J. O. Ware *et al.* (*J. Amer. Soc. Agron.*, **35**, 1943, p. 382. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 345.) F_1 and F_2 generations and first generation back-crosses were obtained from Florida Green Seed × Rowden. The genetics of fuzz colour was investigated. The F_1 showed a narrow colour range intermediate between the deep green of Florida Green Seed and the pure white of Rowden. In the F_2 an almost complete series of colour variation was found, excepting the pure white, which did not reappear; the back-crosses showed less extensive colour ranges. Fibre length was also investigated. The longer values were incompletely dominant in the F_2, and a unimodal distribution of lengths appeared in the F_2. The back-cross with Florida Green Seed reduced the fibre length below the F_1 mean, but the Rowden back-cross did not produce a corresponding increase, perhaps owing to a rather shorter fibre length in the Rowden plant used. A slight association between green colour and shorter fibre length was discovered.

227. HYBRID VIGOUR IN COTTON. I. THE MANIFESTATION OF HYBRID VIGOUR IN THE SEED. By D. Ganesan. (*Ind. J. Genet. Pl. Breed.*, **2**, 1942, p. 134. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 13.) The manifestation of hybrid vigour has been examined in intraspecific hybrids of *Gossypium arboreum* var. *neglectum*. It is necessary to eliminate environmental and maternal influences, and this is possible by means of suitable field methods and the use of reciprocal crosses. It is concluded that "seed weight by itself gives ample evidence of the manifestation of hybrid vigour in the seed, and is a good index in forecasting hybrid vigour in the post-germination period." The author discusses his results in the light of the concept of "initial advantage" which he extends to cover a more general range of observations.

228. MEIOSIS OF A TRIPLE SPECIES HYBRID IN GOSSYPIUM. By S. G. Stephens. (*Nature*, 15/1/44, p. 82.) In this short note on the subject the author states that Skovsted brought forward considerable cytological evidence that New World (n=26) cottons originated by amphidiploidy from crosses between ancestral Asiatic (n=13) and American (n=13) parents. Recently Harland and Beasley have independently synthesized by colchicine treatment amphidiploids from hybrids between present-day Asiatic and American diploid species. Since the synthesized amphidiploids produce partly fertile hydrids on crossing with present-day New World types, they contribute strong supporting evidence to Skovsted's theory. It is pointed out, however, that such evidence can only be considered critical if it can be shown that genom combinations *other* than Asiatic + American do not pair equally well with the New World complement. The author has brought forward phenogenetic evidence which suggests that critical examination of Skovsted's hypothesis may now be confined to testing combinations between Asiatic species and one or other of several entire-leaved species. The following combinations are considered to be worth testing:

(1)	Asiatic (A)* +	*G. aridum*	(D)
(2)	Asiatic (A) +	*G. klotzschianum*	(D)
(3)	Asiatic (A) +	*G. raimondii*	(D)
(4)	Asiatic (A) +	*G. sturtii*	(C)

(* Letters indicate genoms according to Beasley's system.)

It will be noted that all combinations except the fourth include an American diploid genom. Clearly, if *G. sturtii* could be eliminated as a possible ancestor of New World cottons, Skovsted's hypothesis would be considerably strengthened. The low

meiotic pairing found by Skovsted in New World × *G. sturtii* hybrids (A C D) and the high pairing found by Beasley in the corresponding hexaploid $(A\ C\ D)_2$ certainly do not suggest *G. sturtii* as a possible parent—a conclusion supported by the data presented below.

A triploid (A A C) was recently obtained by crossing an autotetraploid Asiatic cotton with *G. sturtii*. The meiotic behaviour of this hybrid has been fully reported by the author elsewhere (*J. Genet.*, **44**, 1942), when it was shown that homology between A and C genoms was very low. The triploid was treated with colchicine, and pollen from some of the distorted flowers produced during the ensuing abnormal vegetative growth appeared to be viable. New World species were accordingly crossed persistently with pollen from these flowers. A completely sterile hybrid with 52 chromosomes was eventually obtained from 103 attempted crosses. Since it is known that the New World female parent (*G. barbadense*) produced normal 26 chromosome gametes, the gametes from the male parent must also have contributed 26 chromosomes. Furthermore, since the hybrid had the distinctive mauve petal colour of *G. sturtii* and plant hairiness characteristic of the Asiatic type used—neither of which characters was carried by the *barbadense* parent—it was certain that both Asiatic and *sturtii* chromosomes had been included. With the knowledge that unbalanced gametes are very rare in Gossypium, and that *sturtii* and Asiatic chromosomes have low homologies, it would appear likely that complete A and C genoms were contributed by the male parent. If this is accepted provisionally, the hybrid should have the following constitution:

$$♀ \rightarrow AD/AC \leftarrow ♂$$

At meiosis the A genoms should pair as bivalents or higher associations, as shown by Skovsted's Asiatic × New World hybrids, while the C and D genoms, if their pairing is similar to that found in Skovsted's American diploid × *G. sturtii* hybrids, should show low and very variable pairing. Univalents should consist of two types—very large from the C set and small from the D set. Meiotic studies of the hybrid agree reasonably well with expectation:

Cross.	Average Number of Univalents per PMC.		Number of PMC's Examined.
Triple hybrid	11·8	0·8	20
Davidsonii × *sturtii*	15·0	0·8	40 } Skovsted's
Sturtii × *armourianum* ..	8·5	0·9	20 } data.

Owing to the uniformly high variability, the number of univalents found in each hybrid barely differs significantly. A typical first metaphase plate is included in the original note as Fig. 1. The great range in size of the univalents is apparent (see also Fig. 2 in note), though the author does not consider it possible to classify them *all* with certainty as C or D types. The evidence as it stands, however, is considered sufficient to demonstrate, under identical cytological conditions, the low homologies existing between Asiatic, New World, and *sturtii* genoms, and hence *G. sturtii* may be dismissed as a possible parent in the origin of New World cottons.

[*Cf.* Abstr. **255**, Vol. XX. of this Review.]

229. The Effect of Environment on Hair Characters and Spinning Value in Sea Island Cotton. By J. B. Hutchinson. (*J. Text. Inst.*, September, 1943, T61.) The results are given of a study of the hair characters and spinning value of lint samples of Sea Island cotton, collected in different seasons and from different islands, undertaken in the hope of identifying the factors responsible for variations in lint quality between areas and also between the crops of different seasons in the same area. The two Sea Island varieties, V.135 and Montserrat Sea Island (MSI), grown in the West Indies, provided excellent material for the purpose.

The general conclusion of the study is that cotton lint is remarkably little affected by the more easily measured environmental influences. The age of the plant is the most important non-genetic cause of variation in effective length, and it is remarkable that this should be the only measured hair character so affected. Data for

V.135 grown at Brighton Estate, St. Vincent, show that the mean difference between bottom and top crop in effective length was over $\frac{3}{32}$ inch. Three pairs of samples from the Montserrat 1939 crop show a similar difference. They were taken from first and second crop on three estates, and gave the following effective lengths (in $\frac{1}{32}$ inch):

Estate.	*First Crop.*	*Second Crop.*
Richmond	54·5	52
Dagenham	54·5	52
Parsons	53·5	52

The only other difference of the same magnitude in effective length is that between MSI samples grown in Montserrat and those from other islands.

The Brighton samples provided an opportunity of testing whether, other things being equal, differences in length in the longest and finest cottons have any effect on spinning value. Bottom and top crop samples were bulked separately, and subjected to a spinning test. . . . So far as a single test can be relied on, it appears that the difference in effective length is reflected in spinning value.

Peirce and Lord (1939) summed up existing knowledge of the relationship between fineness and immaturity in the statement that " the perimeter of the hair depends mainly on the variety of cotton, but the wall thickening is greatly influenced by many conditions affecting the growth of the plant." It was consequently expected that standard hair weight, which is intended to be an estimate of intrinsic fineness or hair diameter, would be fairly constant, but that hair weight and immaturity count would vary in response to some at least of the environmental factors studied. Large variations in immaturity count are a feature of the data, but where differences in immaturity exist between groups of samples grown under different conditions they are more closely associated with differences in standard hair weight than with differences in crude hair weight. This holds for both the inter-island differences in MSI and the differences between fields in the V.135 samples from Brighton Estate. It may be suggested that environmental factors have considerable influence on the hair diameter, and that factors tending to increase diameter tend to decrease maturity. It is possible that this is no more than the deposition of the same amount of cellulose in thicker hairs, but much better information on the distribution of amount of secondary thickening would be required to demonstrate it. The actual factors affecting maturity remain unknown. The Brighton data show that it does not vary systematically either with gross differences in fertility or between bolls produced early and late in the season. Data were also obtained from a variety-cum-manurial trial carried out in St. Vincent in 1938-39 season. There were no significant differences between nitrogen, phosphate, or potash treatments and control in either standard hair weight or immaturity count, although, under the conditions of the experiment, nitrogen manuring increased the yields of the two varieties (V.135 and MSI) greatly. It follows that though maturity is very subject to environmental influences, any attempt to improve it by improving cultural conditions is held up for lack of knowledge of the mode of action of the influences concerned. Data from spinning tests indicated that the differences in standard hair weight and immaturity count between islands growing MSI cotton were not reflected in yarn strength.

Maturity appears to have a considerable influence on the value of Sea Island cotton. Below is given a summary of the colour grading and immaturity counts of 18 MSI samples and 10 V.135 samples submitted for brokers' valuations:

	N.D.	*High Colour.*	*Creamy.*	*Fair Colour.*	*Good Colour.*	*Total.*
MSI	32 to 54	1	1	3	2	7
	18 to 24	1	4	1	1	7
	5 to 7	3	—	1	—	4
V.135	37 to 45	1	1	1	1	4
	16 to 29	5	1	—	—	6

It will be seen that high colour goes in general with low maturity. Brokers' valuations of samples graded "High colour" were fully 2d. per lb. below those graded "Good colour." On the average of all samples tested V.135 and MSI did not differ appreciably in immaturity count. In spinning tests V.135 gave very neppy yarns, and MSI good nep-free yarns. Evidently in this instance the amount of nep is not related to the maturity of the sample; it is probably an index of the technical difficulties in processing extremely fine lint.

In conclusion, maturity is the quality characteristic most affected by environmental variation, and it influences the value of the final product through characters other than spinning value.

230. VARIETAL RESISTANCE TO THE FUSARIUM WILT DISEASE OF COTTON. By V. H. Young and L. M. Humphrey. (*Arkansas Sta. Bull.* 437, 1943. From *Exp. Sta. Rec.*, **90**, 1, 1944, p. 64.) This study revealed marked genetical differences among cotton varieties as to wilt resistance as well as to yielding properties, but indicated also that environmental factors may greatly modify the expression of these differences. Varieties susceptible under favourable conditions include some giving high yields, good staples, and high ginning outturn, whereas others, such as Half-and-Half, are inferior in staple length. Clearly, no highly susceptible varieties should be grown under conditions favouring the disease. Another group comprises varieties such as some strains of Rowden, developed in Arkansas, that are moderately wilt resistant and best described as "wilt tolerant." Except where conditions are extremely favourable to infection such cotton is believed to offer the best present solution to the wilt problem in the State. A comparatively small number of varieties exhibit very high resistance, but none of those now available can compete with some of the less wilt-resistant varieties on non-wilt or low-wilt soils, but where conditions favour the highest wilt incidence no other varieties will succeed. If cotton must be grown in such areas, it is recommended that only some highly resistant variety such as Rhyne Cook be used.

231. MOCK DOMINANCE. By E. R. Dempster. (*Sci.*, **97**, 1943, p. 464. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 31.) The author examines the various assumptions and implications contained in Richey's concept of "mock dominance."

[*Cf.* Abstr. **453**, Vol. XX. of this Review.]

232. APPLICATION OF COLCHICINE TO COTTON. By K. C. Amin. (*Ind. Frmg.*, May, 1943, p. 257.) Discusses briefly the mechanism of reproduction and growth in plants, the application of colchicine to cotton, how it acts, and the results achieved by its use.

233. SUR QUELQUES MODIFICATIONS DES RÉACTIONS PHYSICO-CHIMIQUES DE LA CELLULE VÉGÉTALE, PROVOQUÉES PAR LES SUBSTANCES MITO-INHIBITRICES. By M. Guinochet. (*C.R. Acad. Sci.*, Paris, 1940, **210**, p. 579. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 33.) The author suggests that the effect of colchicine and similar substances is achieved by a modification of the physico-chemical reactions of the cell leading to physiological disturbances of the nucleus.

234. ARTIFICIAL INDUCTION OF POLYPLOIDY, WITH SPECIAL REFERENCE TO COLCHICINE. By R. Khan. (*Sci. and Cult.*, 1942, **7**, p. 480. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 283.) The various methods available for artificial induction of polyploidy are described and discussed.

235. SYMPOSIUM ON THEORETICAL AND PRACTICAL ASPECTS OF POLYPLOIDY IN CROP PLANTS—II. (*Biol. Symp.*, **4**, 1941, pp. 133 and 151. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 317.) AN EVALUATION OF INDUCED POLYPLOIDY AS A METHOD OF BREEDING CROP PLANTS. By L. F. Randolph. The author points out the necessity for caution in the utilization of auto-polyploids for breeding purposes. Many economic plants are already polyploid, and further increases in the chromosome numbers of such types frequently produce inferior forms. On the other hand, used with discretion, the technique is most valuable and may improve the following qualities: sturdiness, size of fruit and seed, frost and drought resistance, and content of various chemical substances—*e.g.*, vitamin A and nicotine. Decrease in fertility is a general drawback in autopolyploid plants, but this can, in some cases,

be overcome by hybridizing unrelated lines or by careful selection. The cause of sterility is still obscure, but it is not adequately explained by multivalent formation and meiotic irregularities. Genetic characters exhibit tetrasomic inheritance as a rule, which has the advantage of masking the effect of recessive lethals and maintaining heterosis. Breeders will find, however, that it takes much longer to fix new lines.

Polyploidy and Mutations. By C. L. Huskins. After admitting the extreme difficulty of making a sharp distinction between mutations and small chromosomal aberrations, the author proceeds to observe that undoubted mutations are very rare in polyploids. The B and C fatuoid oats are both characterized by chromosomal aberrations, although the A type may possibly represent a true mutation. The chances of a recessive mutation becoming homozygous in a polyploid are only slight, and consequently such gene changes "cannot be subject to positive or negative selection pressures." Polyploids differ from diploids in that they provide a nuclear environment favourable to chromosomal aberrations. It is suggested that these facts imply that polyploids have a considerable potentiality for the micro-evolution of closely allied types by means of hybridization and chromosomal changes. Any radically new evolutionary line is, however, regarded as unlikely to arise except from diploid forms. The difficulties attending the use of the concepts of pure line and allelomorphism in connection with polyploids are elaborated.

236. Symposium on Experimental Control of Development and Differentiation—III. (*Biol. Symp.*, **4**, 1941, p. 183. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 317.) Effect of Induced Polyploidy in Plants. By A. F. Blakeslee. An account of the various ways in which chromosome doubling affects the development of the plant is presented. Examples are given of cases in which hybrid sterility has been reduced, but it is pointed out that the colchicine technique produces aneuploid and chimæral plants in addition to the required tetraploids. Also, chromosome doubling need not induce hermaphroditism in diœcious species, although this may occur in a few cases.

237. The Pigment Content of Polyploid Plants. By A. Levan. (*Hereditas*, Lund, 1943, **29**, p. 255. From *Pl. Bre. Abs.*, xiii., **4**, 1943, p. 317.) Species having both diploid and polyploid representatives were selected from eleven different genera and analyzed for chlorophyll content. The diploids usually had a higher chlorophyll content per fresh weight of leaf than the polyploids. One of the causes of the lower pigment content of the polyploids is the greater thickness of the leaves.

238. A Short History of the Plant Sciences. By H. S. Reed. (Chronica Botanica Co., Waltham, Mass., 1942. £1 10s. From *Rev. App. Mycol.*, xxii., **10**, 1943, p. 397.) Included in this manual (Vol. VII. of a new series of plant science books edited by F. Verdoorn) are chapters on mycology, plant pathology, plant nutrition, and mineral constituents in metabolism. The aspects of these topics discussed comprise, *inter alia*, early works on fungi, the initiation of the scientific period, Pasteur's work, physiologic specialization and heterothallism, biochemistry, mycorrhiza, an epoch of discoveries (1750 to 1850), an epoch of expansion, forest pathology, bacterial diseases, virus diseases, and the control of plant diseases.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

239. Review on the Structure of Cellulose Fibres. By W. Marquette. (*Rayon Text. Mo.*, **23**, 9, 1942, p. 62. From *Exp. Sta. Rec.*, **88**, 4, 1943, p. 571.) Deals with the controversial discussion concerning the physical organization of cellulose, as based upon the work of Farr on the one hand, and of Hock and Harris on the other, with independent supporting studies by various other investigators.

240. The Rate of Change in the Properties of Cotton Cellulose under the Prolonged Action of Acids. By G. F. Davidson. (*J. Text. Inst.*, October, 1943, T87.) When cotton cellulose is treated with hydrochloric or sulphuric acid under conditions that do not lead to its dissolution, there is initially a progressive change in the properties of the resulting hydrocelluloses, but ultimately a stage is

reached when little further change in properties occurs; at this stage only a small proportion of the glycosidic linkages in the cellulose have been hydrolyzed. Measurements of the loss of weight suffered by the cellulose show, however, that hydrolysis does not cease when the properties of the hydrocelluloses become constant, but proceeds very slowly. These observations, and the marked contrast between the hydrolysis of cellulose in homogeneous and heterogeneous systems, are explained in terms of differences in the accessibility of glycosidic linkages to the acid, resulting from the partly crystalline, partly amorphous, structure of the fibre. Mercerized cotton is hydrolyzed more rapidly than unmercerized, and the properties of the resulting hydrocelluloses attain constancy at values significantly different from those characteristic of unmercerized cotton and such as represent a greater extent of hydrolytic degradation of the cellulose. This is attributed to the presence of a greater proportion of the more accessible amorphous stage. In some respects the heterogeneous hydrolysis of cotton cellulose by acids closely parallels its oxidative degradation by dilute solutions of chromic acid.

241. A COMPARISON OF FIVE METHODS OF MEASURING FINENESS OF COTTON FIBRES. By M. A. Grimes. (*Text. Res.*, **11**, 1941, p. 459. From *Pl. Bre. Abs.*, xiv., **1**, 1944, p. 60.) The methods, which were applied to five varieties of cotton, were weight per inch, area of cross-sections, widths of fibres collapsed, flooding with NaOH, and mercerizing without tension. Any of these methods will detect wide differences in fineness. Small differences may not be determined with certainty.

242. CORRELATION OF COMBED STAPLE LENGTH ON THE COTTONSEED WITH COMMERCIAL STAPLE LENGTH IN AMERICAN UPLAND COTTON. By J. H. Moore. (*J. Amer. Soc. Agron.*, **35**, 6, 1943, p. 491. From *Exp. Sta. Rec.*, **89**, 6, 1943, p. 662.) Measurements of 325 samples from representative cotton varieties grown on North Carolina farms for two seasons indicated a highly significant correlation coefficient of 0·89 within samples. This fairly close relationship of combed staple length and commercial staple length is deemed of practical value in that either combed on seed or commercial staple length may be used in measuring fibre length, or one method may check the accuracy of the other. Since combed staple length on the seed can be measured by relatively inexperienced help, that method should be used wherever possible.

243. FIBRES: EFFECT OF HIGH TEMPERATURES. By Z. A. Rogovin *et al.* (*Tekstil. Prom.*, **3**, 1941, p. 40. From *J. Text. Inst.*, February, 1944, A70.) Cotton fibres, cuprammonium rayon, and viscose rayon were tested for tensile strength and elasticity at 20° and 120°, the latter temperature being of the order observed in the cord layers of automobile tyres after long running. Cotton fibres and cuprammonium rayon lost 30-40 per cent. of their tensile strength, whereas viscose rayon gained 5-7 per cent. Linen and ramie fibres behaved similarly to cotton fibres. The authors explain these reactions by the differences in the micro-structures of the fibres.

244. COTTON FIBRES: LATERAL EXPANSION UNDER TENSION. By W. J. Lyons. (*Text. Res.*, **13**, 11, 1943, p. 21. From *J. Text. Inst.*, February, 1944, A69.) Experiments were carried out with Peruvian-type cotton of approximately 1¼ inches staple length. Flat bundles of parallel single fibres were held at the ends with cellulose tape, over which in turn the jaws of clamps were fitted. The fibre bundles were held under tension in distilled water at loads just below the breaking point for periods of one-half to one hour. Cathetometric measurements indicated that under the conditions employed elongations of about 6 per cent. occurred. Similar bundles for control were merely soaked in water for equal periods. The bundles were then allowed to dry to equilibrium with the atmospheric conditions of the room (approximately 50 per cent. R.H. at 76° F.), the stretched bundles being held under tension so as to maintain the original stretch. Two tests were carried out with raw fibres and a third test with fibres which had been subjected to Soxhlet extraction with 95 per cent. ethanol, followed by soaking in 1 per cent. caustic soda and washing with water, very dilute sulphuric acid and water. In this third test the stretched and unstretched bundles, after the treatment described above, were dried in a vacuum

oven at 80° C. for several hours and then conditioned. Cross-sections of all the fibre bundles were prepared. Photomicrographs were enlarged and measurements of the cross-sectional areas within the fibre perimeters (whole sections) and in the lumens were made with a polar planimeter. Mean areas for each test are given, together with cell-wall cross-sectional areas (means of differences between whole-section and lumen areas of each fibre), standard errors, and significance evaluations. The data show a statistically-significant increase in the areas of the lumen and whole-fibre cross-sections as a result of wet stretching. The apparent changes in cell-wall areas due to stretching are statistically significant in two of the tests, but the changes are not consistent as to sign throughout the three tests. The data do not show any influence of the extraction or vacuum drying in the third test. An explanation of these results is suggested which is based on the assumption that the principal effect of the tension is the partial removal of the series of collapsed regions (convolutions) from the fibre. The removal of these collapsed regions does not require the rotation of one end of the fibre with respect to the other. It is assumed that the extension due to longitudinal strains within the cell wall and the concomitant lateral contraction of the fibre are negligible, and that the reduction in area implied by the contraction is insufficient to offset the increase due to removal of the convolutions.

245. Cotton Fibre: Protection from Periodate Oxidation. By R. E. Reeves. (*Contrib. Boyce Thompson Inst.*, **13**, 1, 1943, p. 1. From *Summ. Curr. Lit.*, xxiii., **20**, 1943, p. 533.) Raw cotton and cotton after extraction with alcohol and benzene react with a measurable amount of periodic acid before suffering any fall in viscosity. Mercerized and water-extracted cottons suffer a fall in viscosity after treatment with the smallest amount of reagent. Methylation with diazomethane to the extent of 9·8 per cent. or 19·1 per cent. mercerization gives greatly increased resistance to oxidation by periodic acid. Methylated cotton that resists oxidation by periodic acid does not show increased resistance to sodium hypochlorite.

246. Cotton Fibres: Swelling and Solution. By W. Shramek and A. Stenzel. (*Cellulosechemie*, **20**, 1942, p. 38. From *J. Text. Inst.*, August, 1943, A407.) The authors have made motion pictures of the swelling and gradual disintegration and solution of cotton fibre, and seek to interpret their results by reference to the 17 photomicrographs included in the original paper. The secondary layer of the cell wall appears to dissolve spirally. Differences in behaviour between cotton and spruce tracheids are briefly discussed.

247. Cotton Fibre: Testing. By K. L. Hertel. (*Rayon Text. Mnthly.*, **24**, 1943. From *J. Text. Inst.*, February, 1944, A69.) A review of new methods of testing cotton fibre, with special reference to (1) the fibrograph for length analysis, (2) the arealometer for measuring specific surface, and (3) the Pressley bundle-strength tester.

248. Observations on the Causes of Turbidity in Dispersions of Cotton and Modified Cotton in Cuprammonium. By G. F. Davidson. (*J. Text. Inst.*, November, 1943, T97.) It was observed by Whistler, Martin, and Harris that cotton that had been extracted with alcohol and ether to remove wax gave cloudy dispersions in cuprammonium, whereas dispersions of the same material after boiling with dilute sodium hydroxide solution were clear. They isolated and examined the insoluble material responsible for the cloudiness, and showed that it consisted largely of pectic substance; a similar result was obtained with a powdery hydrocellulose prepared from solvent-extracted cotton. These workers also showed that the pectic substance in cotton was completely removed when the cotton was boiled with dilute sodium hydroxide solution, and thus provided an explanation of the clarity of dispersions of cotton that had been boiled with alkali as well as extracted with alcohol and ether. The work of these authors does not, however, account for the turbidity that is found in cuprammonium dispersions of cotton that has been boiled with alkali, but not extracted with a wax solvent. The available evidence pointed to cotton wax as a possible cause of turbidity in cuprammonium dispersions of cotton and modified cotton, and the present investigation was undertaken with the object of obtaining further evidence on this question.

A cuprammonium dispersion of a powdery hydrocellulose prepared from cotton is much less viscous than an equally concentrated dispersion of the unmodified cotton, and on this account the flocculation and sedimentation of finely-divided insoluble material occurs much more readily with the former than with the latter. Because of this advantage offered by powdery hydrocelluloses, the work to be described was done with cotton that had been reduced to powder by the action of hydrochloric acid. Whistler, Martin, and Harris showed that disintegration of cotton fibres by treatment with concentrated hydrochloric acid resulted in a loss of only about 20 per cent. of the pectic substance present, and it has been found that the acid treatment employed in the work produced no significant change in the wax content of the cotton. The method of investigation employed consisted in the separation and examination of the material insoluble in cuprammonium contained in powdery hydrocelluloses made from raw and alkali-boiled cotton, and in the same hydrocelluloses after they had been extracted with chloroform to remove wax. The insoluble portion of the hydrocellulose prepared from raw cotton was found to contain 60 per cent. of cotton wax—identified by means of its X-ray diffraction pattern—and evidence of the presence of pectic substance was obtained. This hydrocellulose after extraction with chloroform gave an insoluble residue that was substantially free from wax, but contained pectic substance, whereas the insoluble portion of the hydrocellulose made from alkali-boiled cotton consisted almost entirely of cotton wax. The proportion of material insoluble in cuprammonium ranged from 0·68 per cent., found with the hydrocellulose prepared from raw cotton, to 0·05 per cent. found with the chloroform-extracted hydrocellulose prepared from alkali-boiled cotton; this latter amount caused only a very slight turbidity in a 2 per cent. dispersion of the hydrocellulose. The presence of suspended matter in cuprammonium dispersions of powdery hydrocellulose made from raw cotton was observed by Farr (*cf.* Abstr. **297**, Vol. XVII. of this review), who reported that the material which settled out from such a dispersion gave the X-ray diffraction pattern of cellulose, and concluded that it consisted of undissolved hydrocellulose. The results obtained in the present investigation provide no support for this view, at least so far as dilute dispersions are concerned. It is, however, possible under certain circumstances to obtain an undissolved residue that is cellulose in character. Jolley has shown that the amount of cellulose that can be dissolved in a cuprammonium solution is limited, and depends on the copper concentration. With the cuprammonium employed in the present work, the limiting ratio of hydrocellulose to solvent beyond which dissolution of the cellulosic component of the hydrocellulose was incomplete was found to lie between 4 and 5 grams per 100 c.c.

249. Cotton Fibre: X-Ray Structure and Strength. By H. W. Barre and E. E. Berkley. (*Proc. Ann. Conv., Assoc. Sthn. Agr. Wkrs.*, **43**, 1942, p. 83. From *Summ. Curr. Lit.*, xxiii., **13**, 1943, p. 349.) There is a reasonably good correlation between the orientation of crystalline cellulose with respect to the long axis of the fibre and the tensile strength as determined by the Chandler bundle method. The X-ray patterns are not much changed in the early stages of biological decay, though the strength may be greatly reduced. Varieties and strains of cotton vary widely in the arrangement of crystalline cellulose in the fibre. Some have a characteristically small angle between the spiral of the cellulose strands and the fibre axis, whilst others have a large angle; the angle ranges from 20° to 44° approximately. The fibre structure of all varieties is apparently affected by climate, especially heat and moisture.

250. Pressley Cotton Fibre Strength Tester: Variation in Results. (*Text. Res.*, **13**, 1943, 9, p. 17. From *Summ. Curr. Lit.*, xxiii., **20**, 1943, p. 525.) A brief report is given of a study of differences between operators and between machines in cotton fibre strength tests with the Pressley tester. Tests were made by 4 operators with 8 machines and 24 varieties of cotton. The breaking order was set up in a randomized block with each operator making 10 breaks in each cotton on each of the machines. The results indicated that there was a statistically significant difference between means for operators and for machines, and observations made

during the tests suggested certain precautions for reducing these differences. The average Pressley strength index ranged from 7·24 to 7·58 for the different operators, or a difference on the Chandler strength basis of 3,000 lb. per sq. in. The principal source of discrepancy in the test results is traceable to the manner in which the ribbon is placed between the clamps. The uniform employment of a ribbon $\frac{1}{4}$ inch wide was found to give the most consistent and accurate results. When proper precautions are exercised by an experienced operator, fairly consistent results can be obtained. Tests made in the morning showed a higher average index than those made in the afternoon; so far, these discrepancies have not been explained.

[*Cf.* Abstr. **468**, Vol. XX. of this Review.]

251. High Density Cotton Bales: Processing in American Mills. By M. E. Campbell. (*Text. Res.*, **13**, 11, 1943, p. 18. From *J. Text. Inst.*, February, 1944, A50.) In normal times American Upland cotton is compressed to high density for export only. Considerable quantities of such cotton have, however, recently been diverted for domestic use. Modern blending feeders coupled with vertical or Buckley-type openers have been found to be effective in handling high-density cotton, and mills so equipped experience little or no difficulty with the bales, although blending with cotton of lower density is not recommended. For mills with obsolete opening equipment, the only solution lies in conditioning either the opened bale or the opened lint. According to the machinery builders, little can be gained by way of modifying old-style equipment, although lower feeder production and closer kicker and doffer roll settings may help. Tests have shown that the compression of cotton to 33 lb. or more per cu. ft., the equivalent of high-density compression, is not harmful to the quality of the fibres when cotton of reasonably good grade is used. The blending of cotton of different densities is detrimental to the uniformity of cotton yarn. An investigation of bale cutting in compressed bales has shown that the cuts are caused by the shearing action of unequal pressures in adjacent parts of the bale. The most common cause of these unequal densities is the "dog ridges" which result from the action of the dogs at the sides of the press boxes of most gins. Severe cutting results in only negligible damage, and this can be eliminated by modifications in bale-pressing equipment.

252. Cotton Cards: Increasing Production. By M. A. Goldman. (*Text. Res.*, xii., **12**, 1942, p. 18. From *Summ. Curr. Lit.*, xxiii., **6**, 1943, p. 141.) Cotton from the bale should be thoroughly opened and cleaned before being passed to the card. With clean cotton heavier feeds and higher speeds can be used. An 18-oz. lap presents a larger area to the licker-in than a 12-oz. lap, and therefore is advanced into the licker-in at a proportionately lower speed and pressure for a required feed. Each licker-in point at higher speed enters the lap more times per minute and works in more cotton, thus providing more time to find and draw free fibres. In each pass the point picks only a fraction of the fibres that it would be obliged to pick from a 12-oz. lap at conventional slow speed. This eliminates the cause for "plucking" and the resulting "flaky" web and "nubby" yarn. The draft between the feed roll and licker-in should be more than 2,000. The draft between the licker-in and cylinder should be less than $1\frac{1}{2}$. The draft between the feed roll and doffer should be more than 100. The licker-in and cylinder should be balanced statically and dynamically and run in lint-sealed anti-friction bearings for speeds of more than 750 and 225 r.p.m. respectively. Testing for coincidence of the axis of rotation with the principal axes of inertia should be done after the card is clothed, ground and located on the floor. In order to overcome vibration that may be due to indeterminate factors and to live load, flexible elements may be introduced between the card and the floor. Flats should be run in counter-direction to the cylinder so that the web will travel into cleaner pins and leave from a clean flat.

253. Cotton Plant: Nitric Acid Pulping. By J. D. Fleming and F. K. Cameron. (*Ind. Eng. Chem.*, **35**, 1943, p. 819. From *Summ. Curr. Lit.*, xxiii., **20**, 1943, p. 518.) Whole cotton (including stems, cusps and seed cotton) and its various components were pulped separately with 5 per cent. nitric acid at atmospheric pressure. No undue degradation of cellulose occurred and the pulps obtained compared favourably

with those from commercial woods in regard to α- and β-cellulose and pentosan contents, copper number and cuprammonium viscosity. No practical reason was apparent for separating the components for the production of pulps.

254. THE GROWING AND PROCESSING OF WHOLE COTTON. By F. K. Cameron. (*J. Elisha Mitchell Sci. Soc.*, **59**, 1, 1943, p. 1. From *Exp. Sta. Rec.*, **89**, 6, 1943, p. 662.) A practical account of the growing and processing of whole cotton for oil and α-cellulose. Cotton is planted close some weeks later than usual in the locality, matures about 25-30 weeks after planting, and is cut and baled. Seed cotton comprises 60 per cent. of the mass of whole cotton, leaves 2 per cent., and the remainder about equally divided between cusps and stems. Discussion is accorded cultural, harvest, and storage methods; production costs; preparation for processing; recovery of cottonseed oil and pulping whole cotton, and costs; cellulose derivatives; and uses of cellulose from whole cotton.

255. COTTON MILL: MODERNIZATION. By J. Buckley. (*Text. Wkly.*, **33**, 1944. From *Summ. Curr. Lit.*, xxiv., **4**, 1944, p. 74.) The author describes in some detail the modernization of a mill with 64,400 mule spindles and a normal output per 48 hours of 40,000 lb. of 36's (average) double roving yarn. A discussion is reported.

256. COTTON MILL: POST-WAR PLANNING. By A. Draper. (*Text. Wkly.*, **32**, 1943, p. 890. From *J. Text. Inst.*, February, 1944, A50.) A report of an address on desirable developments in machine design and lay-out, improving mill conditions for the operatives, cost accounting, and textile education.

257. COTTON SPINNING MILL: REORGANIZATION. (*Text. Rec.*, **60**, 1943, April, June, August. From *Summ. Curr. Lit.*, xxiii., **16/17**, 1943, p. 429.) A series of articles on modern spinning machinery and accessories, and the parts they are likely to play in the post-war reorganization of the industry. (I) The merits of mule and ring spinning and high drafting are discussed. (II) The main features of (*a*) the Four-line roller, (*b*) the Howard and Bullough single-apron, (*c*) the "F.D.C." single-apron, and (*d*) the Casablancas double-apron systems of high drafting are described, and their most advantageous fields of application are discussed. (III) The advantages, scope and limitation of large-package ring spinning are reviewed, and the adaptation of present ring frames for this purpose are described.

258. SPINNING: DISCUSSION. Textile Operating Executives of Georgia. (*Cotton, U.S.*, **107**, 6, 1943, p. 95. From *Summ. Curr. Lit.*, xxiii., **21**, 1943, p. 549.) The following topics are discussed: Cleaning frames; shape of ring flange; travellers coming off after oiling; synthetic high-draft aprons; piecing-up in high-draft spinning; training spinners.

259. FIBRES: SPINNING QUALITY. By C. D. Brandt. (*Rayon Text. Mnthly.*, **24**, 1943, p. 351. From *J. Text. Inst.*, October, 1943, A597.) The writer raises the question: "What are the qualities of a fibre that govern its spinning value?" He places intrinsic *strength* first and records the following relative values for different fibres obtained in the Chandler bundle test: flax 190, nylon 112, cotton 100, viscose rayon 83, silk 80, cellulose acetate rayon 58, wool 28, and casein fibre 18. The influence of *length* is shown by plots of (1) yarn strength against average fibre length on the Baer diagram, and (2) strength against count for a series of yarns spun from the same cotton. The importance of *twist* as a means to secure clinging of fibres is shown in a plot of yarn strength against twists per inch for the same cotton in 13's, 18's, and 27's, and by the breaking load of 1·00-hank roving prepared from 1-inch cotton. In the latter tests, if the strength at the normal 1·2 twists per inch is taken as 100, the strengths at 1·0, 1·5, and 2·0 t.p.i. are 16, 220, and 390 respectively. It is pointed out that the strength of a cotton yarn is commonly only a fraction of what might be expected from a fibre bundle test (23 per cent. in one test on 20's yarn). In viscose rayon staple it is shown that the curve connecting yarn strength and count falls more rapidly the coarser the denier. With nylon staple it appears possible to utilize the intrinsic fibre strength to greater advantage than with cotton; thus the 12 per cent. excess in strength of nylon fibre (3-denier, 2-inch) over cotton rises to a 70 per cent. excess in spun yarn.

260. COTTON: OILING AT THE SCUTCHER. By E. H. Helliwell. (*Text. World*, **93**, 7, 1943, p. 87. From *Summ. Curr. Lit.*, xxiii., **21**, 1943, p. 548.) A concise statement is given of present knowledge of the advantages of spraying cotton with about 0·28 to 0·30 per cent. of its weight of a "conditioning oil" at the scutcher. The oils are said to consist of a mineral oil that does not oxidize, leave gummy deposits on the cotton, or interfere with wet processing, blended with a hygroscopic agent that tends to prevent the generation of static electricity.

261. COTTON YARN STRENGTH: INFLUENCE OF FIBRE PROPERTIES. (*Rayon Text. Mnthly.*, **24**, 1943; **25**, 1944. From *Summ. Curr. Lit.*, xxiv., **6**, 1944, p. 132.) The writer draws on work by Turner and his Indian colleagues, and more recent data by British and American workers, in a discussion of the relationships between fibre length, fineness and strength, twist and yarn count and strength. The loss in fibre strength on applying twist to bundles of cotton and rayon fibres is calculated and the influences of the angle of inclination, θ, of the fibre in the (theoretical) helix and of the distance from the yarn centre are discussed. The cosine of the average fibre angle is obtained from the ratio of the length of yarn (into which twist is being inserted) to the speed of the front roller. The distribution of pressure due to twist and of strain along fibres at various points in a yarn is discussed, and its effect in producing different elongations and unequal elastic limits is indicated.

262. COMBED COTTON YARN: QUALITY: EFFECT OF PERCENTAGE OF COMBER WASTE. By M. E. Campbell and J. M. Cook. (*Text. Res.*, **13**, 8, 1943, p. 16. From *J. Text. Inst.*, October, 1943, A566.) Cotton from a bale classed as $1\frac{1}{32}$-inch staple and Strict Middling grade was manufactured into carded yarns, and into combed yarns with nine different percentages of comber waste ranging from 0·57 to 24·20 per cent. As comber waste percentages increased, the fibre lengths in the sliver became more uniform. The length at the 25 per cent. point of the array increased about $\frac{1}{64}$ inch and the mean length about $\frac{1}{16}$ inch for the complete range of waste percentages. Although the average fineness of the fibres in the slivers was scarcely changed, the average content of immature fibres decreased somewhat, and these immature fibres were found to be present in the waste. Yarn strength increased significantly even when a negligible amount of comber waste was taken out, probably because of the drafting and slight combing action of the machine. The increase in strength with greater waste percentages was fairly consistent, and averaged 1 per cent. for each 2 per cent. increase in waste. A 5 per cent. increase in waste increased the average yarn strength to the same degree as would be obtained by an increase of $\frac{1}{32}$ inch in the staple length of the raw cotton. Yarn appearance was approximately as good at the 8 per cent. level as at the higher levels of comber waste. At about the 16 per cent. level for comber waste, which approximates to the average percentage for "Peeler" cottons, the yarn strength was 11·6 per cent. higher than was that for carded yarns, and yarn appearance was up to two-thirds of a grade higher. Since the investigation showed that, for cotton of normal character, staple length of raw cotton is interchangeable with comber waste as far as the effects on yarn strength are concerned, a study was made of the relative costs of substituting an increase in comber waste for an increase in staple length. It was estimated that, for the range of staple lengths $1\frac{1}{8}$ to $1\frac{1}{16}$ inches, and for comber waste percentages ranging from 10 to 20 per cent., an equivalent improvement in yarn strength can be made more cheaply by increasing comber waste than by using longer staple lengths of cotton.

263. COTTON, LINEN AND WOOL FABRICS: DETERIORATION IN STORAGE. By R. E. Rogers and M. Hayes. (*Text. Res.*, **13**, 6, 1943, p. 20. From *J. Text. Inst.*, August, 1943, A408.) Bleached cotton sheeting (74 ends, 66 picks per inch, 4·7 oz. per sq. yd., 4·9 per cent. of starch filling), filled and desized; bleached linen sheeting, desized (56 × 56; 5·2 oz.); and bleached, degreased woollen serge (78 × 72; 8·4 oz.) were stored in the dark at average temperatures of 78° and 102° F. for 4 years and in diffused light at 78° F. At the start and at intervals of 6 months samples of the cellulosic materials were tested for breaking load, fluidity in cuprammonium and copper number, and the serge was tested for breaking load, elongation, cystine sulphur, moisture, and methylene blue absorption. Changes in light reflectance were also

measured after 2 and 4 years for materials stored in the dark. Full particulars are recorded, with the analysis of variance of the data. Cotton and linen samples were stored in the dark, both wrapped and unwrapped, but wrapping did not affect the results significantly. The results show that determination was more severe at the higher temperature and in the light, and that desized cotton kept better than filled cotton. For cotton and wool the extra damage consequent on exposure to diffused light was about the same as that due to raising the temperature, but for linen it was greater.

264. Mercerized Cotton: Chemical Reactivity and X-Ray Diffraction Pattern. By R. E. Reeves and W. A. Sisson. (*Contrib. Boyce Thompson Inst.*, **13**, 1, 1943, p. 11. From *Summ. Curr. Lit.*, xxiii., **20**, 1943, p. 525.) Cotton was mercerized with caustic soda ranging from 9 to 40 per cent. at temperatures from $-10°$ to 60°. These treatments produced partial and complete mercerization. Ethereal diazomethane was used to determine the reactivities of the treated samples. The extent of methylation was least for native, intermediate for partially mercerized, and greatest for fully mercerized cotton. The change in reactivity was parallel to the change in type of X-ray pattern. The "island" in the temperature/concentration diagram at 5° and 40 per cent. showed the low reactivity and X-ray pattern typical of native cotton. Hot glycerol treatment at 290° produces more complete reversion of mercerized cotton than boiling water treatment, as shown by both the methylation data and X-ray patterns. The methylation data indicate that the glycerol treatment might produce almost complete reversion.

265. Textile Terms and Definitions. (*J. Text. Inst.*, June, 1943, P103.) Lists of definitions and notes approved for publication by the Textile Terms and Definitions Committee. The lists will be reconsidered later, in the light of criticisms which might be received, before the definitions in their final form are adopted.

266. Textile Fibres under the X-Rays. By Dr. W. T. Astbury, F.R.S. (Published, apparently for private circulation, by Imperial Chemical Industries, Ltd. Reviewed *J. Text. Inst.*, August, 1943, P123.) This monograph is the second in a series of scientific monographs which the I.C.I. Dyestuffs, Ltd., are publishing as suitable subjects arise. Much more ambitious than the first, "*Textile Fibres under the Microscope*," it is a unique collection of reproductions of X-ray photographs of textile and other fibres. These are beautifully printed and reproduced at the original sizes. The value of the album is enhanced by a clearly written account of the technique employed by the author, an acknowledged authority on the use of X-rays in the field of textiles.—R. H. Pickard.

267. Textile Fibres: Moisture Relations and Drying Problems. By A. C. Walker. (*Text. Res.*, **13**, 5, 1943, p. 15. From *J. Text. Inst.*, August, 1943, A406.) A report of a lecture on the effects of temperature and humidity on the physical properties of fibres. The subjects covered are: moisture absorption and desorption; hysteresis in the effects of humidity on moisture sorption and electrical resistance; combined effects of heat and humidity during the drying of textiles; the effects of scouring and finishing agents on sorption by cotton, wool, and rayon; package drying of cotton yarn (advantages are claimed for a high rate of air flow); and the theory of moisture distribution in fibres, with special reference to the bad effects on the electrical resistance of drying cotton so far that the initial monomolecular layer of moisture is removed from the internal surfaces.

268. Volumetric Determination of Moisture in Cotton Textiles. By J. F. Keating and W. M. Scott. (*Amer. Dyes. Rptr.*, **31**, 13, 1942, p. P308. From *Exp. Sta. Rec.*, **88**, 4, 1943, p. 572.) The determination of water in mixtures by titration with the Karl Fischer reagent (containing iodine, sulphur dioxide, and pyridine dissolved in methanol) was successfully applied in the determination of moisture regain in cotton textiles by extraction of the fabric with cold methanol and subsequent titration of the water in the extract with the reagent. The titration procedure resulted in considerable saving of time, and the results obtained were more accurate than those obtained by the standard procedure of oven drying at 105°-110° C.

269. Tentative Methods of Test for Resistance of Textile Fabrics to Micro-organisms. (*A.S.T.M. Stand.*, 1942, p. 59. From *Rev. App. Mycol.*, xxii., **10**, 1943, p. 359.) Two procedures are proposed by the Committee D-13 on Textile Materials of the American Society for Testing Materials in connection with the testing of canvas, duck, and similar fabrics designed for outdoor use—viz., (1) an accelerated mildew infection test in which the material is incubated with a stock culture of *Chætomium globosum*, and (2) a soil burial test, involving the burial of specimens of the fabrics for 6 weeks in soil containing an abundance of cellulose-destroying organisms maintained at a temperature of $90^\circ \pm 5^\circ$ F. at a depth of 1 inch below the surface. The visible effects of the experimental processes on the materials are observed and loss in strength determined.

270. Textile Research: Development. By E. R. Schwarz. (*Text. Res.*, **13**, 2, 1942, p. 20. From *Sumn. Curr. Lit.*, xxiii., **9**, 1943, p. 264.) Modern developments in textile technology, such as the use of polarized light and fluorescent light in the study of fibres, are briefly discussed, and the need for further investigations of the ultimate structure of textile fibres is emphasized. It is pointed out, however, that the finest scientific investigations are of no practical significance to the industry if they cannot be understood by the manufacturer and put into intelligent and active use. For this purpose both the scientist and the man in industry require training. The former must know the problems of the latter, and the practical limitations which beset the mill man on every side. The manufacturer must realize the attitude of mind essential to a good research worker, and must make a serious and honest effort to become familiar with at least the simpler language of science.

TRADE, PRICES, NEW USES, ETC.

271. World Cotton Crop, 1942-43. (*Cotton*, M/c, 12/2/44.) The world cotton crop for the 1942-43 season is now estimated at approximately 27,250,000 bales. This is about 1 per cent. smaller than the previous year, and is the smallest crop since 1935. The largest change occurred in the United States, where production increased from 10,744,000 bales in 1941 to 12,817,000, an increase of nearly 2,100,000 bales. This, however, was more than offset by reductions of about 1,300,000 bales in India and 900,000 bales in Egypt. The net decline of all countries is estimated at about 200,000 bales.

272. Major World Cotton Crops and their Qualities. (*Cotton*, M/c, 29/5/43.) A table is given showing cotton production and the staple length distribution of the crops in the United States, India, Russia, China, Egypt, Brazil, Peru, Mexico, Argentina, Sudan, Uganda, Chosen, Turkey, Belgian Congo, and Iran, which together produce more than 96 per cent. of the world's cotton. It is stated that though 57 countries produce cotton commercially, 6 countries—the United States, India, Russia, China, Egypt, and Brazil—produce over 90 per cent. of the world's cotton.

273. Industry and Research. (*Text. Mnfr.*, November, 1943, p. 503.) A report compiled by a special Committee of the Federation of British Industries, under the chairmanship of Sir William Larke, makes recommendations for the future organization of research and research in firms. It deals with the following among other matters: the need for the extension of research; the individual firm and research; research associations and their relationship with the Dept. of Scientific and Industrial Research. The establishment of a Bureau of Industrial Research which should be national in scope is recommended.

274. Cotton Board Post-War Problems Report. (*Text. Mnfr.*, February, 1944, p. 51.) The Cotton Board "Committee to enquire into post-war problems" has submitted a report to the President of the Board of Trade, who has agreed to its publication. Among the recommendations made by the Committee are the following: the need for a strong central Board, prices management, a suitably sized and balanced industry eliminating redundancy, good working conditions, improved stability and security of employment, opportunity for continuous re-equipment, research, and a higher degree of co-ordination amongst the agencies at work.

275. British Textile Industry: Post-War Development and Quality Control. By B. H. Wilsdon. (*J. Soc. Dyers and Col.*, **59**, 1943, p. 161. From *Summ. Curr. Lit.*, xxiii., **20**, 1943, p. 543.) A discussion of post-war industry and quality control in which the main points are as follows: (1) Post-war economic reconstruction demands, and almost certainly will take the form of, a centralized control designed to manage the economics of the textile and allied industries on a national plane. (2) Apart from supplying the requirements of the home market, the industry will be forced more and more to rely for exports on specialty rather than staple goods. (3) The disappearance of *laissez faire* on the economic plane will lead to a process of industrial absorption tending to bigger concerns and exaggerated monopoly development. (4) A localized and horizontally organized industry, rather than highly geared concerns, is best suited to meet requirements. (5) In order to preserve this flexibility through survival of small firms, it will be necessary (*a*) to ensure continuity of research and facilities for development by co-operative action, and (*b*) to adopt co-operative measures for the preservation of standards of quality in manufactures, labour conditions, trade practice, etc. (6) Both objectives will depend on acceptance of some form of regulation backed by sanctions, the former in respect of financial contributions equitably distributed and the latter by some form of certification marking. (7) The control of such quality standards should be in the hands of the processing industry and not those of distributors, wholesalers or neutral or semi-Government bodies.

276. Textile Industry Prospects. By Sir Raymond Streat. (*Text. Mnfr.*, December, 1943, p. 517.) A discussion of some post-war prospects and difficulties, and the danger of controversies on theoretical, party, or sectional lines.

277. Future Marketing of Raw Cotton. By A. Bryce Muir. (*J. Text. Inst.*, January, 1944, p. 1.) In this paper the author deals with the import and distribution of raw cotton under the Cotton Control, and goes on to consider how that control can be gradually relaxed and ultimately abolished after the war, and with what machinery it should be replaced. He suggests that "soon after the termination of hostilities the Controller should work through the Liverpool and Manchester Cotton Associations, using them to carry out his policy and liquidate his commitments. As soon as practicable the Liverpool Futures Market should re-open, at first under limitations necessitated by unsettled conditions, and gradually be re-established to serve the interests of the whole trade, as in the past, by providing insurance against the risks of loss due to fluctuations in price, and thus be able to provide Lancashire with ample supplies of the cheapest cotton in the world. To re-establish a great export market these conditions are essential."

278. "Cottonleather": Properties and Uses. Southern Friction Materials Co. (*Text. World*, **93**, 5, 1943, p. 99. From *Summ. Curr. Lit.*, xxiii., **16/17**, 1943, p. 439.) "Cottonleather" consists of a cotton fabric of 2-6 plies in thickness which has been impregnated with a thermosetting binder, cured, calendered, and surface-ground to resemble leather in colour. It is semi-flexible, water-repellent, and resists oil and heat. An outstanding characteristic is its good resistance to abrasion, which has made it suitable as a substitute for shoe-sole leather. Among industrial applications suggested are for pickers, motor-support pads, shock-absorbing pads, bearing mounts, draw-bar spacers and anti-rattlers. It is not recommended as a belting material. "Cottonleather" is available in widths up to 6 inches and thickness up to $\frac{5}{16}$ inch.

279. Cotton Stalks: Use for Production of Boards. By F. W. Z. Burg. (*Paper Ind. Paper World*, **25**, 1943, p. 612. From *Summ. Curr. Lit.*, xxiv., **3**, **1944**, p. 60.) Experiments on the utilization of cotton stalks for the production of boards are reported. The total yield of board was about 90 per cent. of the weight of material fed to the hammer mill. The boards had a modulus of rupture of 80-500 lb. per sq. in., the thinner boards showing a higher strength on the average than the thicker ones. The thermal conductivity varied between 0·291 and 0·708 B.t.u. per hour per °F. per sq. ft. per inch. The commercial feasibility of the process is discussed and an estimate is made of the cost of construction and operation of a plant.

280. Cotton Thread: Use in Surgery. By S. A. Localio and J. W. Hinton. (*Surg., Gynec., Obstet.*, **72**, 1941, p. 615. From *J. Text. Inst.*, February, 1944, A72.) Tensile strengths of samples of silk, linen, and cotton threads were determined as bought and after various sterilizing procedures. Cotton should be boiled for 10-12 minutes and used while wet. The tensile strength is decreased by autoclaving, or by drying after boiling. Cotton thread was successfully used in 50 major surgical operations.

281. Cottonseed Meal in Phenolic Plastics. By F. Rosenthal. (*Indus. and Eng. Chem.*, **34**, 10, 1942, p. 1154. From *Exp. Sta. Rec.*, **89**, 2, 1943, p. 154.) The author states that cottonseed meal increases the flow of phenolic compounds when substituted for an inert filler. Compounds containing equal weights of phenolic resin, cottonseed hulls, and cottonseed meal afford a reduced raw material cost of 20·5 per cent. as compared to that of 50 : 50 resin : filler compounds. They are considered to have favourable flow and cure-time properties at temperatures between 320° and 360° F. After proper processing their water absorption in 24 hours is 0·8 per cent., and their strength characteristics approach those of commercial phenolic compounds.

[*Cf.* Abstr. **269**, Vol. XIX. of this Review.)

MISCELLANEOUS.

282. Scientific Research and the Universities in Post-War Britain. (Report of the Parliamentary and Scientific Committee, 1943.) Pt. I. of the report stresses the need for increased fundamental, agricultural, veterinary, medical, industrial, and university research. Pt. II. discusses the supply and training of research personnel. The following are among the recommendations made by the Committee: Scientific research and the application of scientific knowledge should be promoted on a far bolder and more imaginative scale than in 1919-39 if Britain is to maintain her position in the post-war world and carry out her plans for reconstruction. There should accordingly be proportional expansion of the supply of scientific personnel. This in turn calls for expansion at the universities and technical colleges, and an all-round improvement in the teaching of science and scientific principles at all stages of education for the whole school population of the country. State Bursaries and Engineering Cadetships should be continued after the war is over, and developed to cover science not hitherto included, and the recommendations of the Norwood Committee on this point generously implemented. Materials and finance should be made available for the expansion of research schools in the universities. University staffs, stipends, and buildings should all be increased. A capital sum of £10 millions will be required for buildings and equipment spread over the first five post-war years, as well as adequate priority for the work and materials involved. The present annual Treasury grant to the universities of approximately £2¼ millions per annum should be increased to £6 or 7 millions per annum. The freedom, independence and diversity of the universities should not be prejudiced in any circumstances, but to ensure the best use of the increased funds, and to avoid wasteful overlapping, they should set up a suitable Universities Advisory Council. There should be a considerable increase in the Parliamentary Grants-in-Aid to the Royal Society for Scientific Investigations and Publications.

283. Scientific and Industrial Research: Organization. By O. W. Roskill. (*Eng.*, **156**, 1943. From *J. Text. Inst.*, December, 1943, A734.) A broad review is given of the organization of research under the main headings: Pure and applied research in the natural sciences; Testing; Invention; Pure and applied research in economics; Consumer research; Finance of and expenditure on research; Education for research; Co-ordination of research; Research and national economy; and Research and industrial structure. Figures are given to show the magnitude of the undertakings in Great Britain, the United States, Germany, and Japan.

284. Dictionary of Science and Technology in English, French, German, Spanish. By Dr. Maxim Newmark. (Phil. Liby. Inc., New York, 1943. $6.

From *Nature*, 18/12/43, p. 709.) This dictionary contains 10,000 English terms that are frequently used in the physical sciences and their applied fields, together with separate indexes in French, German, and Spanish, conversion tables and technical abbreviations. The total number of entries, including cross-references, is about 50,000. The English part is divided into alphabetical sections (A, B, C, etc.); each word is followed by its equivalent in French, German, and Spanish, always in that order, and a number. Parts containing the foreign words follow, each word bearing a letter and a number referring to the English part. An example will make this clear:

Border, chaudière *f.*; Dampfkessel *m.*; caldera *f.* . . . (354)
Chaudière, B354;

and similarly for the German and Spanish words. This arrangement saves an extraordinary amount of space in comparison with the arrangement usual in polyglot dictionaries. The pure sciences included are chemistry, physics, and some mathematics. Of the applied sciences, engineering in all its branches is particularly well treated, but meteorology, navigation, and photography also receive attention. The book is a credit to the institution where it was conceived, the Brooklyn Technical High School.

ADDENDUM.

285. Skinner's Cotton Trade Directory of the World, 1944. (Pubd. annually by Thos. Skinner and Co. [Publishers], Ltd., London, Manchester, Bradford, New York, Montreal.) This is the twenty-first edition of this invaluable publication. The efficient compilation of such a Directory, arduous under normal conditions, is infinitely more so in war-time, but in spite of this the customary revision of details has been carried through in so far as has been possible. The revision of details covering enemy and enemy-occupied territories has, of course, not been possible, and such countries have been omitted from this edition. The present conditions of trading, particularly the accepted restriction on the export of cotton goods, and perhaps equally so the effect of the "concentration" of industry, has brought into prominence the vital need for keeping before the trade the various trade marks, and the Trade Marks Section has been appreciably augmented by the addition of lists of the principal Canadian and United States textile trade marks and branded goods. The Piece Goods Merchants Section has been reconstructed, and now includes information relating to Merchant Converters, and an addition has been made to the Silk and Rayon Section covering Merchant Converters in this branch also. The Hosiery and Knit Goods Manufacturers Section is published as a separate volume, but its contents are also included in the Directory. The thumb-holes for ease of reference are labelled: Contents; Index; Exporters; Merchants; Spinners, Manufacturers and Doublers; Directors (British); Dyers, Finishers; Fabrics; Silk and Rayon; Hosiery and Knit Goods; Hosiery Yarn Spinners, etc.; British Trade Marks; Canadian Trade Marks; U.S.A. Trade Marks; Mill Supplies. All headings, indices, and explanatory notes are printed in English, French, German, Italian, Spanish and Portuguese. The Directory is quite indispensable to all those concerned in any way with the cotton industry. The price by post, inland and abroad, is £1 10s.; Canada and United States, $7 (post and duty free).

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ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

286. INDIAN COTTON CROP 1943-44: CONTROLLED PRICES. (*Ind. Text. J.*, **54**, 1943, p. 103. From *J. Text. Inst.*, May, 1944, A187.) The minimum and maximum prices for various types of Indian cotton, fixed for 1943-44 by the Indian Government, are tabulated. Thus, the range for Indian Cotton Contract cotton (Jarilla, ⅞ inch) is 400-550 rupees per candy (784 lb.) and for Cambodia and Punjab-American 289F cottons 610-760 rupees. The Government proposes to buy new crop (1943-44) cotton and sell it in relation to the interests of the growers and the condition of the markets. The basis on which purchase will be made is briefly explained. The Government does not desire to upset normal trading, but reserves the right to sell the cotton it purchases at any time when it is considered in the general interest to do so.

287. INDIAN COTTON STATISTICS. We have received from the Indian Central Cotton Committee copies of Statistical Leaflets Nos. 2, 3 and 4, 1942-43, giving information regarding the following: stocks of Indian raw cotton held in India by the mills and the trade on August 31, 1943; receipts at mills in India of raw cotton classified by varieties; approximate distribution by staple length of Indian cotton received at mills; exports by sea of Indian cotton classified by varieties, 1942-43 season.

288. INDIAN COTTON OPERATIVES: ABSENTEEISM AND WAGES. By V. B. Kotdawala and H. P. Oza. (*Ind. Text. J.*, **53**, 1943, p. 397. From *J. Text. Inst.*, March, 1944, A135.) Labour statistics for Ahmedabad (monthly, 1932-1942) and Bombay (yearly averages, 1939-1942) are tabulated and graphed. The authors draw the inference from them that, allowing for such passing events as strikes, threats of air raids, etc., the incidence of absenteeism is directly equated to the cost of living bonus granted since 1940. They appear to despair of teaching the operatives to use the bonus on more food, sanitation and education, instead of liquor, cinemas and the like, and advocate a system of deferred payments.

289. SCIENTIFIC AND INDUSTRIAL RESEARCH: ORGANIZATION FOR INDIA. By Sir S. S. Bhatnagar. (*Ind. Text. J.*, **54**, 1944, p. 201. From *J. Text. Inst.*, July, 1944, A332.) A report of an address outlining a scheme for the organization of scientific and industrial research in India.

290. INDIAN CENTRAL COTTON COMMITTEE. (*Ann. Rpt.*, 1942-43.) In the twenty-second annual report, recently received, it is stated that despite war conditions the research and other activities continued unhampered and good progress was recorded in each branch. Thirty-two research and eighteen seed distribution and extension schemes financed by the Committee were in operation. The various Acts passed for the regulation of transport, marketing, ginning and pressing of cotton, and the prevention of the introduction of foreign cotton pests, continued to function satisfactorily. Investigations were carried out on the following pests and diseases: black-headed cricket, bollworm, jassid, stem weevil, and the root-rot and wilt

diseases. At the Indore Institute of Plant Industry good progress was made with the work in connection with cotton genetics and plant breeding, physiology, field-plot technique, seed multiplication and extension. At the Technological Research Laboratory the number of samples tested was 1,129, and 234 reports on them were issued. In addition a number of technological investigations were in progress connected with the combing of good quality Indian cottons; the spinning of very small samples of 2 lb. weight; the effect of using different front roller speeds, roller settings and different weights on sliver in the draw-frame; the effect of employing different speeds of beater and fan in the Crighton Opener; the evolution of a method by statistical analysis to combine different yarn strength results for accurately judging the significance of the difference between any two samples; the influence of swollen hair diameter on the spinning quality of *Arboreum* cottons; the influence of manurial treatment on the fibre properties of Gaorani 6; the prediction of the spinning quality of Indian cottons from their measurable fibre characters.

291. SPINNING TEST REPORTS ON INDIAN COTTONS, 1938-44. By N. Ahmad. (*Tech. Circs. Nos.* 569-573, 575, 577, 583. Ind. Cent. Cott. Comm.) The circulars contain the grader's report and spinning test results for Nanded Bani, Gaorani 6, Malvi and Bawla cottons for the 1943-44 season; grader's report and spinning test results on carded and combed samples of 289F (saw-ginned) and A. R. Kampala cotton, 1941-42 season, P. A. Multan 289F and A. R. Kampala, Umri Gaorani 6 and A. R. Kampala, Mirpur Sind Sudhar (saw-ginned) and A. R. Kampala, Feroza 43F (roller-ginned) and A. R. Kampala, 1942-43 season; report of the Standards Committee and spinning test results for Jarila and Sind Sudhar, 1943-44 season; report of the Standards Committee, valuation report, and spinning test results for LSS cotton, 1938-44 seasons.

292. SPINNING TESTS ON MIXTURES OF STAPLE FIBRE WITH INDIAN COTTONS. By —. Srinagabhushana and N. Ahmad. (*Tech. Bull., Ser. A, No.* 59, 1944. Ind. Cent. Cott. Comm.) The results are given of experiments undertaken in order to examine the suitability of mixing staple fibre of 1-inch length and 1·5 denier with three Indian cottons, Jayawant, Cambodia Co.2, and Surat 1027ALF in different proportions, spinning the mixtures with different drafts and twists, and studying the yarn characteristics in both the dry and wet state. A detailed study of the fibre properties of the raw materials has also been made to ascertain how far the variable spinning performance of the mixtures can be traced to them.

293. TECHNOLOGICAL REPORTS ON INDIAN COTTONS, 1943-44. By N. Ahmad. (*Tech. Circs. Nos.* 574, 576. Ind. Cent. Cott. Comm.) The particulars given include agricultural details, grader's report, fibre particulars, spinning test results, remarks.

Jarila.—Yarns somewhat neppy. An appreciable decline in spinning performance in the past three seasons. Suitable for 25's warp.

*V.*434 (*Akola*).—Yarns slightly less neppy. Suitable for 30's warp.

294. TECHNOLOGICAL REPORTS ON STANDARD INDIAN COTTONS, 1943. By N. Ahmad. (*Tech. Bull., Ser. A*, 58, 1943. Ind. Cent. Cott. Comm.) As in former years, the agricultural details, grader's report, fibre particulars, spinning tests and remarks are given for each of the eighteen cottons tested. Three cottons showed a definite improvement over last season, twelve gave practically the same performance, while three showed a falling-off. Improvement was most marked in 1027ALF (Bombay), Sind Sudhar R.G. (Sind), and P.A.4F (Punjab), and was not confined to any one province but appeared to have occurred in the Western part of the country. Little change was shown by Jayawant, Gadag 1, Jarila, Wagad, 289F/K25, LSS, Mollisoni, Sind N.R., Sind Sudhar S.G., Cambodia Co.2, Nandyal 14 and Koilpatti, but there was a definite decline in spinning performance of V.434, Umri Bani, and Karunganni C.7.

295. TECHNOLOGICAL REPORTS ON TRADE VARIETIES OF INDIAN COTTONS, 1943. By N. Ahmad. (*Tech. Bull., Ser. A, No.* 57, 1943. Ind. Cent. Cott. Comm.) The valuation reports of the Standards Committee and of the Special Appeal Committee and spinning test results are given for eighteen varieties of cotton supplied by the

East India Cotton Association, the grader's report and spinning test results for seven cottons supplied by the Bombay Millowners' Association, four by the Ahmedabad Millowners' Association, and three by the Southern India Millowners' Association.

296. BARODA: COTTON PLANT PULLER PROPAGANDA. By C. V. Sane. (*Ind. Frmg.*, December, 1943, p. 602.) The advantages of the plant puller for removing cotton roots and the measures taken to ensure its use in the Baroda State are briefly discussed.

297. BOMBAY COTTON ANNUAL, 1942-43, No. 24. (East India Cotton Assen., Ltd., Bombay. Price Rs. 2-0-0.) This is the usual authoritative compendium of all matters relating to every branch of the cotton trade. The first section contains the twenty-second Annual Report of the Directors of the East India Cotton Association for the season 1942-43. This is followed by numerous statistical tables of acreage, production, exports, imports, prices, stocks, consumption, Government notifications, etc. An account is also included of the progress made in the introduction of improved varieties of cotton. The publication should meet the requirements of all who are interested in the production, distribution and consumption of Indian and foreign cottons, yarn and cloth.

298. DHOLLERAS COTTON IMPROVEMENT. (*Ind. Frmg.*, September, 1943, p. 468.) *Wagad Cotton.*—This cotton is the principal variety of the commercial Dholleras and is cultivated in the Ahmedabad district, the Mehsana district of Baroda State, in northern Kathiawar, and in Cutch. The characteristic feature of the Wagad cotton is that the bolls open slightly when ripe and are consequently picked bodily from the plant, the seed cotton being extracted later when convenient. With a ginning outturn of 39 per cent. and a staple length of $\frac{3}{4}$ to $\frac{7}{8}$ inch this cotton is capable of spinning 13's highest standard warp counts and is both hardy and resistant to adverse climatic conditions. A scheme for the improvement of Wagad cottons has been financed by the Indian Central Cotton Committee. Attempts made in the past to improve Wagad cotton resulted in the selection of a strain known as Wagad 8, which is superior to local Wagad in yield of seed cotton and ginning outturn; spinning value, however, is slightly inferior to the local. Efforts have been made to improve the quality of Wagad by hybridizing it with quality *herbaceums* like 1027ALF and BD8. Of the segregates isolated from the early hybrid material, segregates 4-1 and 7-1 have been found promising. The former is a closed-boll derivative from the backcross (Wagad 8 × 1027ALF) × Wagad 8, and in trials gave on an average 7 per cent. more seed cotton, 21 per cent. more lint and 5·7 per cent. higher ginning outturn than the local Wagad. It is finer and capable of spinning on an average 16's highest standard warp counts. Further trials will be carried out with this strain in localities where it has not been tested previously. The other promising segregate, 7-1, isolated from the cross Wagad 8 × 1027ALF, is an open-boll type which has done well in the Lalio tract of Mehsana district. It is superior to Chokadia and Broach local in respect of lint yield and ginning outturn, and approaches 1027ALF of Surat in spinning value. Further trials of this strain are to be carried out.

299. PUNJAB: EFFECT OF DIFFERENTIAL IRRIGATION ON FIELD BEHAVIOUR AND QUALITY OF PUNJAB-AMERICAN 4F COTTON. By M. Afzal and N. Ahmad. (*Ind. J. Agr. Sci.*, August, 1943, p. 357.) The results of irrigation experiments on Punjab-American 4F involving seven different types of irrigation have been discussed. Flowers and bolls produced per plant were not correlated with the quantity of water given to the crop, but, in general, the yield was correlated with watering. Ridging versus flat sowing gave indifferent results. The application of more water during the growing period is likely to improve, to a small extent, the mean fibre length of P.A.4F. The amount of irrigation applied to the crop did not produce any significant effect either on the mean fibre weight per inch or the standard hair weight of this cotton. The percentage of mature hairs in P.A.4F showed a tendency to increase with the amount of water applied to the crop. The spinning performance of P.A.4F showed a slight tendency to improve with the addition of more water to the crop.

300. A STUDY OF THE CHANGES IN THE QUALITY OF PUNJAB-AMERICAN 289F/43 COTTON WITH VARIATIONS IN THE DATES OF SOWING AND WITH PROGRESSIVE PICKINGS. By S. Rajaraman and M. Afzal. (*Ind. J. Agr. Sci.*, August, 1943, p. 355.) In the major portion of the Canal Colonies in the Punjab the general agricultural practice of sowing cotton extends over a period of about a month from May 15 to June 15. To study the effect of date of sowing on the quality of lint of P.A.289F/43 sowings were carried out in 1937 in randomized blocks with seven replications. The dates of sowing were: April 15, May 5, May 20, June 4, July 1. The third and fourth sowings were within the range of general agricultural practice, the second was slightly earlier, the first too early, and the fifth too late. The lint produced in each of the sowings was tested for the six fibre characters: mean fibre length, modal length, fibre-length irregularity (per cent.), mean fibre-weight per unit length, percentage of mature fibres, and highest standard warp counts (calculated). The third and fourth sowings yielded lint of the same quality. The second sowing, somewhat earlier than in normal agricultural practice, had, in this year, produced lint of the same quality as in the third and fourth sowings. The first sowing produced lint definitely inferior in quality to those from the second, third, and fourth sowings. The pickings from the fifth sowing were on the aggregate similar in quality to corresponding pickings from the second, third, and fourth sowings even though the lower percentage of mature fibres in the former would detract from the quality of the yarn spun from them by introducing undesirable factors, such as neppiness, which are known to be caused, *inter alia*, by immature fibres.

301. STUDIES IN THE PERIODIC PARTIAL FAILURES OF THE PUNJAB-AMERICAN COTTONS IN THE PUNJAB. VIII. THE RELATION OF WEATHER FACTORS WITH THE SPREAD OF *Tirak* IN AMERICAN COTTONS. By R. H. Dastur and U. C. Tashna. (*Ind. J. Agr. Sci.*, October, 1943, p. 449.) The intensity and spread of *tirak* in the Punjab has varied from year to year. In 1921, 1926, 1927, 1928 and 1932 larger areas than usual were affected by the disease, and yields were reduced by 20 to 45 per cent. An attempt was made, therefore, to determine the weather conditions that might be responsible for such annual variations in the spread and intensity of the disease. The yields of three important districts of the Punjab and of three cotton farms located in the three districts for the 1921-40 period showed annual variations after the secular variations were eliminated by the use of Fisher's method of polynomial curves. Thus the effect of seasonal factors was visible in the yield series. The years in which *tirak* appeared coincided with the depressions in the polynomial curves. Correlation studies between the weather factors singly and in combination and the yield series after elimination of secular trends, were made, but the results obtained were complex, and gave no indication of the weather factors that could be associated with the years of low yields. Any such correlation was not expected as the variations in yield can be due to several factors. The yields depend on the boll numbers, and the number of bolls produced per plant would depend on the seasonal conditions and biotic factors operating at different stages of growth. In the Punjab the additional physiological factor of *tirak* which affects the boll weight also operates and determines the yields. The seasonal factors that may affect the production of bolls may be different from those that may affect the boll size. Thus no direct relationship between weather factors and yield was obtained. It was, however, possible to get some idea regarding the nature of weather factors that appeared to increase the incidence of *tirak* in the Punjab-American cottons. The *tirak* years are characterized by a hot September or October, with spells of unusually warm weather lasting for ten days or more. The monthly means of maximum temperatures were either above the normal monthly mean by 2° to 5° F. or there were spells of warm weather lasting for ten days or more when temperatures were above normal. Some of the years were also characterized by total absence of rain in September. When the correlation coefficients between yields and the degrees above the normal maximum temperatures (average of ten years) were determined it was found there was a negative correlation between temperature and yields, and

in the case of the Multan and Montgomery districts they were either significant or on the verge of significance.

[*Cf.* Abstr. 417, Vol. XX. of this Review.]

302. United Provinces. Improved Types of Cotton. By B. L. Sethi and M. A. A. Ansari. (*Ind. Frmg.*, September, 1943, p. 461.) Plant-breeding operations carried out by the Dept. of Agriculture since 1905 have resulted in the evolution of a number of improved types which have passed into general cultivation in varying extent. Among the most important are C402, A19, JN1, CA9 (American cotton); C520 and Perso-American. Of these the last two have proved particularly hardy, high yielding and superior in quality in the cotton-growing areas in the United Provinces. C520 is an early hardy variety with white flowers and narrow leaves. The average yield of *kapas* per acre varies from 6 to 9 maunds under unirrigated and irrigated conditions, respectively. With a ginning percentage of 35·5 and a staple length of 0·76 inch it is capable of spinning up to 13's warp counts. Perso-American is a single-line selection from exotic material (*G. hirsutum*) imported from Persia and acclimatized in the United Provinces. It is a high-yielding and early variety. The plants have broad, three-lobed leaves and large, widely expanding pale yellow flowers. The seeds are large and fuzzy, and the seed-coat varies from brown to black in colour. The average yield of *kapas* per acre is about 10 maunds. With a ginning percentage of 32 and a staple length of 0·88 inch it is capable of spinning up to 32's maximum warp counts.

303. Handloom Weaving in Assam. By H. K. Nandi. (*Ind. Frmg.*, December, 1943, p. 620.) The number of handlooms operating in Assam is stated to be over 420,000, and the quantity of mill-spun yarn imported into the province and consumed by these looms annually is 14,500 bales valued at about Rs. 2 crores. The quality of yarn used is from 6 counts up to 100 counts, but the counts most common are from 10's to 42's. The quantity of handspun yarn produced in the province is negligible; the industry is mainly engaged in producing towels, tablecloths, sheets, curtains, shirtings and suitings, etc. The ordinary Assam hand-woven cloth, though much more expensive than the cloth of the same texture produced by power looms, is very much liked because of its lasting quality and artistic style and design. The industry in Assam, instead of succumbing in the face of cheaper mill products, has made steady progress for the following reasons: the absence of a cotton mill in the province; local demand for a variety of products of more artistic and elaborate styles and designs; strength and durability of the garments; use of cheap tools and appliances representing small capital; weaving being carried on mainly by women; historical background of the industry and the vast army of workers whose ancestors were weavers. Suggestions are made for further development of the industry by the introduction of improved appliances and efficient fly-shuttle handlooms; supplying the weavers with proper warps and wefts and yarn wound on bobbins; establishment of suitable depots for stocking yarns of different counts in demand; sale of finished products through co-operative societies; production of medium and long-staple cotton in the province to make the raw materials available locally.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

304. British Cotton Growing Association. The thirty-ninth Annual Report to December 31, 1943, states that the Empire (excluding India) cotton production during 1942-43 was disappointing, in round figures 565,000 bales less than the previous season, and over 300,000 bales less than the 1940-41 season. The greatest decrease was in Uganda, with 116,000 bales only, compared with over 400,000 bales in its record year, while Nigeria and Tanganyika productions were about half of their best. A notable exception to these smaller crops was the Sudan with a 60,000 bales increase, and this again headed the list of Empire-producing countries. While the dominant factor in the decrease was adverse weather conditions—unfavourable planting and growing conditions often have a cumulative effect in that food crops suffer at the same time and great efforts have to be made to re-establish them to

the detriment of cash crops—the necessity of producing other crops essential to the war effort, replacing some formerly grown in enemy-occupied territories, also contributed to the decline. The Cotton Board Committee which enquired into post-war problems, in dealing with raw cotton, stated that no useful purpose would be served in outlining methods by which raw cotton should be marketed in this country until the international position is known. From the Empire producer's point of view it is considered essential, and only equitable, if cotton is to become a free market necessitating "futures" contracts, that Empire cotton should be tenderable on the same contracts and under the same conditions regarding quality as American and Egyptian.

The work of the B.C.G.A. (Punjab), Ltd., was continued. The wheat crop was satisfactory, but the cotton crop was disappointing: 21,662 acres under cotton gave an average yield of 552 lb. seed cotton per acre, compared with 648 lb. in the previous season. The decline in yield was due primarily to a small and badly distributed rainfall. The crop was late and attacked by White fly. Thirteen ginning factories were in operation, and the total turnover was 148,674 bales. Two oil expelling mills, Khanewal and Multan, crushed 20,000 tons of cotton seed; a third mill, Jahania, 25 miles from Khanewal, is now coming into operation. Over 2,500 tons of seed of long-staple cotton, sufficient for sowing 282,000 acres, was sold, chiefly to the Punjab Government and to the Bahawalpur State. Lack of transport for the despatch of cotton, etc., was one of the Company's biggest problems, but this difficulty must be expected in wartime.

305. ASIA. CYPRUS: COTTON INDUSTRY, 1943. A recent report from the Dept. of Agriculture states that the area and production of cotton were the best for the last three years. Production in 1943 amounted to 1,661 bales of 400 lb. compared with 1,589 in 1942 and 722 in 1941. The quality was improved by a further extension of the cultivation of the American variety Coker 100, which is becoming increasingly popular in Cyprus owing to its high quality and yield.

306. AFRICA. COTTON GROWING IN EASTERN AFRICA. By Sir William Himbury. (*E. Afr. and Rhod.*, 18/11/43, p. 264.) An interesting survey of progress between the wars. Cotton growing in the Sudan, Uganda, Kenya, Tanganyika, and Nyasaland was on a comparatively small scale at the termination of the 1914-18 war, but there was every indication of it becoming a sound industry. Exports from these territories in 1919 totalled 50,000 bales of 400 lb. each, Uganda being the chief contributor with 36,000 bales. Progress for the next twenty years up to the outbreak of this war, despite the astonishing strides, was, allowing for seasonable variations chiefly due to climatic conditions, equally remarkable for its steadiness. In 1921 exports exceeded 120,000 bales; 1924 saw the 200,000 mark reached; two years later shipments rose to over a third of a million bales with Uganda contributing over half the total in each of the years mentioned. A slight setback in Uganda in 1927 saw the Sudan take pride of place as the chief contributor with an export of nearly 159,000 bales out of the total of 317,000. The 400,000 bales mark was exceeded in 1929, with Uganda topping 200,000 bales. A big stride forward in 1935 saw exports over 600,000 bales, and by the outbreak of this war the three-quarter million mark had been exceeded several times. Writing of the future, Sir William is of opinion that there is every reason to believe that cotton growing in East Africa will continue to increase, though not with the remarkable strides of the between-wars period, and by increased yields rather than increases of the planted area. Raising the standard of living of the producers of raw materials by stable and higher price levels is one of the main features for most of the plans for post-war progress in the Colonial Empire, and any such plans must benefit the cotton growers of East Africa and, of course, East Africa generally. All these cottons are of good quality; they compare most favourably with similar types from the older cotton-growing countries, and are purchased and marketed in competition with them. Spinners are loud in their praise of Empire cottons, which have come to stay, and therefore in the matter of tendering against future contracts they should receive on the market the same consideration as similar types of American

or Egyptian. No article on cotton growing in East Africa should omit mention of the great part played by the Governments and administrations in consistently fostering the industry; of the Agricultural Departments for their development work, the introduction of new types of seed, and the elimination or control of pests and diseases; and of the assistance given to them in this connection by the Empire Cotton Growing Corporation. The greatest compliment to the work of them all has been the response of the African producer to their advice and guidance. Mention must also be made of the Sudan Plantations Syndicate for their part in bringing the Gezira cotton scheme to success.

307. NIGERIA: COTTON INDUSTRY, 1943-44. (*Half-yrly. Rpt. to March,* 1944.) *Northern Provinces.*—There was a decline in cotton output owing to the very late rains and to the priority given to groundnut production; in addition there was increased demand for cotton from the local spinning and weaving industries. Thirty-eight cotton markets were in operation, or thirteen less than last year. For the fourth season the Produce Inspection Branch supervised the operation of the gazetted markets. Increased efforts to raise the standard of Grade I cotton, and to establish uniformity between different provinces, resulted in a greater percentage of Grade II cotton than usual—probably about 10 per cent. compared with 5·7 per cent. last year. The ginning percentage of the Awai district continued to be higher than from other markets, at around 36 per cent.

Southern Provinces.—The crop was promising early in the season; weather at planting time was favourable and growth satisfactory up to the flowering stage, when exceptional drought was experienced. Weather at the beginning of harvest was unfavourable, heavy rain and winds in the first three weeks of March dislodging the bolls and resulting in the cotton being very dirty.

308. COTTON PRODUCTION IN NORTHERN NIGERIA. By Sir Geoffrey Evans. (*Text. Wkly.*, **33**, 1944, p. 906. From *Summ. Curr. Lit.*, xxiv., **13**, 1944, p. 305.) Impressions gathered on a visit to Nigeria in February and March, 1944, are briefly reported. The village people were bringing in the final pickings from the tops of the cotton plants. The cotton was of excellent grade but weak, and the suggestion is made that a late harmattan (intensely dry north wind) had led to premature desiccation of the plants and bolls and thus to immature fibre. There is increased local demand for cotton, from which the Hausa people make coarse, rather thick, hard-wearing cloth.

309. NYASALAND: COTTON INDUSTRY, 1943. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1942-43.) After producing in 1942 a crop that had only once been exceeded in size in the last seven years, Nyasaland had to report a very small output in 1943, owing mainly to insect pest damage in the Lower River area. The jassid attack was one of the most severe ever known, and the attack of red bollworm which followed is described as completely devastating. The entomologists have completed their survey of the red bollworm problem, and their report has made it clear that the solution bristles with difficulties. Various methods of control appear to be worth trying; which of them should be chosen will depend largely on the extent to which its adoption would necessitate a fundamental alteration in native agricultural practice in the Lower River area. The question is receiving the careful attention of the Government.

The arrangements for the purchase of the cotton crop by the Imperial Government at guaranteed prices, which were made last year for all the East African cotton-producing countries, have given great satisfaction in Nyasaland. If the Government do not exercise their option to buy the crop, it will be available for commercial purchase in the ordinary way. If a profit is made on lint purchased by the Government, it will be placed to the credit of a fund which will be used for the benefit of the cotton industry.

At the Domira Bay Station soil and climatic conditions make the growing of green vegetables and some other suitable food crops for the labour employed on the Station a difficult matter in the dry season. They can only be grown successfully on land which is irrigated in some way; areas which have natural sub-irrigation are

lacking in this district, and irrigation from bore-holes is slow and expensive. A small experiment has therefore been started on the possibility of storing surface storm water by means of a simply constructed form of dam. Should this be successful, there is a considerable area of undeveloped land near the Station which only needs water and anti-erosion measures to make it permanently habitable. Any such development is a Government matter, but the Corporation's staff will give any technical advice or help desired. The Government are greatly interested in the experiment and have agreed to refund to the Corporation the cost of the small dams already constructed at the Cotton Station.

310. Work of the Domira Bay Station, 1942-43. (*Prog. Rpts. from Exp. Stats.*, 1942-43.) The merits of a three-year "rest" period for the restoration of soil fertility have been confirmed for maize as well as for cotton, and work has been begun to see if four years might not be even better. The fears expressed in 1942 about cotton/groundnut relations in a rotation have not so far proved justified. Mz.561 cotton has come to the fore at the Station as a leading variety and its possibilities are being thoroughly explored. N.C., a cross made at the Station, is proving a fair performer and may be useful if the U.4 style of lint is to be retained in Nyasaland. Certain Crown Land selections have given promising results, and work on two of them, C.L.20 and C.L.119, is being intensified. They combine fine lint and good jassid-resistance, though C.L.20 is rather susceptible to blackarm disease. The close season measures for the control of red bollworm appeared as successful as in the previous five years.

311. Southern Rhodesia: Work of the Cotton Breeding Station, Gatooma, 1942-43. By G. S. Cameron. (*Prog. Rpts. from Exp. Stats.*, 1942-43.) The season was too wet to be considered a good one for cotton, but crops turned out better than anticipated. Excessive stainer damage resulted in poor quality seed. A new strain, 9L18, issued to certain farmers for bulking, did well, and those who grew it were impressed with its performance. Another strain, 9L34, due to follow 9L18 into commercial cultivation, is being nursed for a further year on the Cotton Station. The effect of jassids, though not more numerous than in former years, was very pronounced, and advantage was taken of the fact to eliminate susceptible strains. No injury was caused by aphis, termites or American bollworm, but Sudan bollworm caused much loss of flowers and young bolls. Despite the nature of the season, there was very little angular leafspot and no evidence of blackarm.

312. South Africa: Work of the Cotton Experiment Station, Barberton, 1942-43. By D. MacDonald, D. F. Ruston and H. E. King. (*Prog. Rpts. from Exp. Stats.*, 1942-43.) The staff was increased to its pre-war level for cotton breeding and a full season's work was carried out, very satisfactory progress being made. In a variety trial of U.4 strains, 5143, now in general cultivation, was again outyielded by two strains of other U.4 families. The following hybrid material was carried a step further: (*a*) *U.S.×Cambodia lots.* These again gave excellent results. Bulks were carried forward for multiplication and inclusion in variety trials. Similarly promising material, though less advanced, was obtained from the U.4-M.U.8 crosses. (*b*) *U.4 and M.U.8×Coker Wild's, F_3 and backcrosses.* Some difficulty was experienced in finding good hairiness combined with the full Coker quality of lint, but many reasonably good plants were carried forward. A negative correlation was found between hairiness and lint length. Crosses of U.4 and M.U.8 with other "quality" *hirsutum* parents have been made or carried to F_2. Uganda B.P.52 appears to be a particularly promising parent. (*c*) *U.4×Sea Island and Egyptian, F_3.* This material showed extreme variation, including some plants with a leaf hairiness greater than anything else examined. Many plants were found with excellent lint and leaf hairiness and good field characters, thus providing most promising material for continued selection work.

A detailed microscopic examination was made of hairiness on various parts of the plant in a number of varieties and crosses, also on the leaf in the material under (c) above. The range in both density and length of hairs is very much greater in

the *barbadense* crosses than in the plain *hirsutum* material. Hairiness was found to vary appreciably with vegetative vigour, a lower vigour giving higher density, with more hairs per bunch, but the hairs are shorter.

An extremely close connection has been demonstrated between *hairiness* and *jassid-resistance* in a wide range of material. Both density and length of hairs are shown to be of importance. The evidence, taken as a whole, appears to indicate that hairiness *causes* resistance to jassid in the field. Hairiness of the stem is of very minor importance (if any) compared with that of the leaf.

313. Work of the Cotton Experiment Stations, Bremersdorp and Croydon, 1942-43. By J. V. Lochrie. (*Prog. Rpts. from Exp. Stats.*, 1942-43.) In general the season was one of high but very badly distributed rainfall, and yields of all crops were poor. Injury from pests and diseases was also considerable, especially red bollworm and stainer on cotton, and Top Grub on cereal crops. Cotton strain tests were carried out in conjunction with Barberton Station. A series of fertilizer experiments was conducted both on maize and on cotton crops, and confirm previous work on the importance of phosphate at Bremersdorp and nitrogen at Croydon. In the rotation experiment the effect of cotton on the growth and yield of a succeeding maize crop was pronounced. Selection work on maize and strain tests of maize and kaffircorn were carried out.

314. Swaziland: Memorandum on the Policy and Plans for the Immediate and Post-war Development of the Agriculture, Veterinary, Dairying, and Forestry Services of the Agricultural and Veterinary Department of Swaziland. (March, 1944.) A general description of the Territory is followed by various sections dealing with: *Animal Health and Industry* :—disease control, cattle improvement, horse improvement, stock limitation and the improvement of grazing and pastures, dairy industry, sheep industry, Government cattle sales, hides and skins, bacon factory and cold storage. *Departmental Organization: Agricultural Development* :—control of soil erosion, witchweed control, grain storage, agricultural research, agricultural education, water supplies, land settlement, local industry, European rehabilitation and settlement. *Forestry* :—plans for development. Appendices are also included giving statistics of area, rainfall, expenditure, etc.

An appreciation of the work of the Corporation is expressed by the Director of Veterinary and Agricultural Services in the following terms: "This Territory owes a great deal to the work of the Empire Cotton Growing Corporation, and if the plans submitted in this Memorandum are approved and the necessary monies obtained the country will more than ever be in their debt. Mr. J. V. Lochrie, O.B.E., who is in charge of the Central Experiment Station has contributed largely to those Sections dealing with Research, the Control of Witchweed, and the Improvement of Pastures and Grazing. It is, however, to Mr. H. Hutchinson of the Corporation that my chief debt is due for his advice and collaboration in the preparation of this Memorandum. His experience of native agriculture and his appreciation of the real issues at stake have to a considerable extent determined the direction of approach to many of the problems confronting us and so enabled us, more particularly with the Agricultural Sections, to evolve the policies and plans here laid down."

315. Sudan: Cotton Industry, 1942-43. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1942-43.) In spite of the fact that in the 1942-43 season the production of American cotton in the Sudan was but 15 per cent. of that of the previous season, the country's total crop recorded a substantial increase, due in the main to a bumper season in the Gezira, and Gash and Tokar Deltas. The average ginning outturn for the whole crop (all grades combined) was as follows: Sakel types, 34·4 per cent.; American types, 30 per cent.

Cotton Prospects, 1943-44.—In the Gezira the areas are practically the same as last season, but the crop is considerably poorer, due in the main to heavy jassid attack. The area in Tokar is substantially less than last year. X1730A has again been sown, and the crop, though late, is not unsatisfactory. In the Gash Delta the area sown is slightly greater than that of last season, but the crop is unlikely to be much more than half of what it was a year ago. Both Sakel and X1730A and a

small area of N.T.2/41 have been sown. On the Government Estates both X1730A and Sakel have been planted, but the crops are much poorer than in 1942-43. On the White Nile Estates the prospects of both Sakel and X1730A are fair. No cotton has been cultivated under irrigated conditions with the exception of the Sudan Plantations Syndicate's Zeidab Scheme, where Wild's has been sown as usual. In the Kordofan, Upper Nile and Equatoria areas food crops have taken precedence over cotton and only small acreages of the latter have been planted.

316. Work of the Plant Breeding Stations, 1942-43. (*Prog. Rpts. from Exp. Stats.*, 1942-43.) In this report an attempt has been made to outline the various problems that are being dealt with in the three localities in which the Plant Breeding Section is actively engaged—the Gezira, Kordofan Province, and Equatoria. In the northern part of the Gezira the main variety grown is Domains Sakel, and in the south X1730A, a bushy selection from Domains Sakel. The chief problems in the northern Gezira have been leaf curl, jassid, and to a lesser degree, blackarm. The climate is drier than in the south, so there is less likelihood of blackarm disease being spread by wind-blown rain. Domains Sakel, which produces fine lint of high quality, is susceptible to all. Present control measures have lessened the dangers of crop failure, but the fact that these dangers still lurk in the background has necessitated a change of policy. In future greater attention will be given to Domains Sakel and to the work of producing from it high quality selections resistant to jassid and to blackarm and leaf curl diseases. In the south, where rainfall is higher, the possibility of a severe blackarm outbreak is ever present. X1730A, when once well established, has a tendency to grow away from this disease, but it can by no means be considered resistant. Under Gezira conditions X1730A is resistant to leaf curl. Control measures for blackarm disease, which include thorough sweeping up and burning of all debris, seed disinfection with mercurial dusts, and finally a sowing date delayed beyond what is considered the optimum by the Sudan Plantations Syndicate, are costly and wasteful. Dr. Knight is directing work at Shambat towards the production of blackarm-resistant strains of each variety. This work is meeting with success and promising material has been produced containing one factor for resistance; it will not be complete, however, until at least one and perhaps two more factors for resistance have been added. When this very highly resistant material has been produced (it should be available for bulking in 1946-47), it is expected to replace the present susceptible material, and thus do away with the need for continuing the costly control measures so necessary under present conditions. Following on from this, the Egyptian cotton selection work for the Gezira is being carried out at the Research Farm under Mr. Evelyn's direction, the object being the production of strains resistant to leaf curl with lint of better quality and more uniformity. In the Nuba Mountains, and areas where crops are dependent on rain, somewhat different problems are met with. In these areas experiments conducted under Mr. Anson's supervision are being carried out with a view to obtaining, for the Nuba Mountains, an early-maturing, heavy-yielding strain of cotton giving a high outturn of good quality lint. A degree of resistance to both blackarm and jassid is also necessary. Earliness is very essential as the rains are short, and because many growers plant their cotton on plains situated a considerable distance from their villages and are dependent on fullahs (dams) for their water supply. When these dry up they are obliged to return to their villages. It follows, therefore, that an early-ripening crop stands most chance of being completely harvested. High ginning outturn is also of importance as, owing to transport difficulties, there is at present no sale for the seed. In Equatoria jassid and blackarm resistance are of major importance. It is satisfactory to report that substantial progress has been and is being made in all branches of the work undertaken by the Plant Breeding Section.

317. Cotton Deal with India. (*Crown Col.*, May, 1944, p. 362.) As a result of discussions which have recently taken place between representatives of the Sudan Government and the Government of India in New Delhi, any Sudan cotton allocated by the Ministry of Supply to India will be sold on the basis of prices for Indian

cotton ruling at the time of the negotiations, subject to agreed margins for various qualities of Sudan cotton. The Government of India is introducing a control scheme for textile exports. All export cloth will be inspected under arrangements made by the Government of India and certified as being of a certain standard and quality. As soon as the control scheme is in operation, it is the intention of the Sudan Government to use the credits obtained from the sale of raw cotton to India to reduce the price of cloth imported from India. For this purpose it is considered desirable that importers of textiles from India should be formed into a group, and discussions for this purpose are to be held between the War Supply Department and the Sudan Chamber of Commerce.

318. War-time Uses of Sudan Cotton. (*Crown Col.*, June, 1944, p. 438.) In a recent broadcast, Mr. Aubrey Hesketh, managing director of a large cotton manufacturing company, one of the oldest spinners of Sudan cotton in Lancashire, stated that in 1942 and 1943 Sudan cotton crops were the best they had ever had—grade, staple length, and strength being really first-class. The cotton was now being spun and woven into some of the most important fabrics used by the fighting services. In particular, the Ministry of Aircraft Production had made tremendous use of Sudan cotton. Its strength played an important part in obtaining the minimum strength specifications laid down for the fabrics for barrage balloons and rubber dinghies, various kinds of aeroplane fabrics, and the special gabardine used to protect airmen from extreme cold and storm. Even for parachutes, formerly made entirely of silk, Sudan cotton is now the foundation. This cotton is also being used to spin and weave special cloths, which, after treatment with various kinds of resin, are made into sheets with the strength of steel. Great use is being made of these plastic sheets in the construction of all kinds of weapons.

319. Cottonseed Exports. (*Crown Col.*, June, 1944, p. 438.) Last year exports of cottonseed were resumed, and reached a total of over 113,000 tons. For more than two years prior to this Sudan cottonseed could find no market. A little was burned by the railways to save coal, or exported to Palestine, but most was buried in pits in the Gezira to await barges and transport. In 1943, however, the Middle East Supply Centre re-established its value as an edible oilseed, and considerable export was achieved in spite of transport difficulties.

320. Advantages of the Gezira Scheme. By A. Gaitskell. (*E. Afr. and Rhod.*, 18/11/43, p. 231.) A brief history is given of the events leading to the inauguration in 1925 of the Gezira Scheme, which constitutes a partnership, on a profit-sharing basis, between the Sudan Government, the Native tenants, and the Sudan Plantations Syndicate. The management is under the direction of the Syndicate. By the Scheme Government has acquired and taken responsibility for all land in the Gezira, paying the owners a rent equivalent to the highest market rate before the initiation of the Scheme, and in addition giving them priority options to tenancies. The following advantages have thus accrued to the tenant: he needs no capital; pays no rent for land or water; receives loans for hiring additional labour at harvest time; has the benefit of a scientific research institute to select his seed, plant the best rotation, and protect his crops from disease. He is provided with instruction, supervision, and tools, and, if necessary, with artificial manures for his crops, and his cotton is transported, graded, and marketed for him. In addition a considerable reserve fund has been built up to tide him over bad years. All these features of the Scheme have given it a remarkable financial stability, so that to-day, in spite of passing through the great trade depression and with a capital of nearly £15,000,000 extending over 1,000,000 acres of very varying land and over 20,000 tenants of varying ability, the total of outstanding debts of individual tenants is less that £5,000. It should be noted that the profits are not pooled irrespective of output, but each tenant's share of the cotton profits is calculated on the exact yield and grade which he individually produces; his millet and other crops belong to him personally in their entirety.

The Scheme has been a very good financial investment. On the eve of the war it was contributing to the central Government of the Sudan 25 per cent. of the whole

revenue of the country. To the circulation of trade in general within the country it was contributing the enormous sum of £750,000 per annum by way of loans and profit payments to tenants, and a further £100,000 in the employment of labour in its workshops and factories. To the maintenance of the Sudan Railways alone it contributed a further £400,000 a year in traffic payments. Its fine cotton is in urgent demand for war purposes. In the Royal Air Force it is being used for balloon barrages, bomber tyres, parachute cords, rubber dinghies, and electrical insulating equipment. In addition, 50,000 tons of cottonseed have been supplied to the Sudan Railways as a substitute for coal, thereby saving 25,000 tons of shipping space. A further large quantity is being supplied to provide cooking oil for the Army in Egypt. The fine harbour facilities of Port Sudan, and even sections of the Sudan Railways line, which have played such a conspicuous part in defeating the Sudan's immediate enemies in the war, largely owe their existence to the Gezira Scheme.

Before the inception of the Scheme the whole 5,000,000 acres of the Gezira produced about 130,000 tons of rain-grown dura (millet) a year; to-day the irrigated area alone produces more than half this quantity from only one-fifth of the land. This steady production of the staple food of the country has totally abolished the danger of famine in the Gezira.

The effects of the Scheme on society have been both good and bad. In the first place slavery has been totally abolished in a land where slavery was rife. By providing an economic living for far greater numbers than ever before could live off the land, a genuine co-operative society has been brought into being in which extreme differences in wealth are rare—a factor which should be of great benefit to the stability of the country. But parallel with this economic emancipation there has been a breaking down of family traditional authority, and personal gain has become increasingly the only criterion for conduct. There is thus a very great need for the restoration of authority on the basis of community service, and for a better social morality. There is also an immense need for better sanitation and health services, for elementary education and recreation, and for the tenants to learn self-management in their own affairs. The Scheme is endeavouring to satisfy these needs, and is trying to make some all-embracing plan which will cover the educational, medical, and political as well as the agricultural fields.

321. Uganda: Cotton Industry, 1943-44. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1942-43.) The Department of Agriculture undertook a vigorous campaign to secure a normal crop of 350,000 bales, and in this they were considerably assisted firstly by the favourable reaction on the part of the growers to the improvement that took place in the prices paid in 1942-43, when it was announced that the East African Governments would undertake to purchase the whole of the cotton crop on the basis of a fixed price, and secondly, by the fact that growers could be told before they planted their crops the minimum prices they would receive in 1944.

In 1943 cotton was planted early in most districts and the acreage was almost equal to that of 1941, but, unfortunately, in Buganda the large maize crop grown especially as a war-time effort was harvested late, and a large acreage of cotton was also planted late in consequence. Prospects after planting were reasonably good, but steadily deteriorated during the season owing to the almost complete failure of the short rains. Attack from *Lygus* was severe in one or two areas, and blackarm also caused damage in two districts. It is expected that the grade of the crop will generally be good since much of it has been picked under dry conditions, but the staple will be on the short side.

At Kawanda the experimental work of the Department of Agriculture has been largely directed towards the re-purification of the strain B.P.52; at Serere increased attention has been given to basic agricultural considerations and the physiological requirements of the cotton plant.

322. Benefits of Cotton Control. (*Crown Col.*, July, 1944, p. 507.) The chairman of the Uganda Co., Ltd., in a statement circulated with the report of the Company, stated that last year witnessed a bold and beneficent experiment in

Government control. In previous years, owing to the unsettled state of the Uganda cotton trade, the Government had been compelled to take certain steps to ensure orderly marketing and reasonable prices. Such steps were temporary expedients to overcome pressing difficulties, but now the Uganda Government, in co-operation with the Ministry of Supply, has fixed prices for the purchase of cotton from growers and ginners for the duration of the war and one year after. All cotton ginned is delivered to the Cotton Exporters' Group, which, operating on behalf of the Government, meets the Ministry's requirements at the agreed price and sells any surplus to other markets. Profits arising from the scheme are for Government account, and will be used for the benefit of the cotton industry and the cotton areas. In 1942 the growers got an average of Sh. 8.80, a price which discouraged planting for 1943, when the price was fixed at Sh. 14. The Company welcomes the scheme, as it is equitable to all parties, ensures orderly marketing and a definite future price to the grower, and retains in Government's hands temporary profits which in the hands of individuals could bring no lasting advantage to them or to the community. Wisely used, the fund now being accumulated may have far-reaching results on the future welfare and prosperity of Uganda.

323. SPINNING AND WEAVING. (*Crown Col.*, May, 1944, p. 361.) A new kind of spinning apparatus is now being designed to help speed up the development of the Protectorate's new spinning and weaving industry. The textile workshops, run by the Uganda Industrial Committee, have been working for a year, and have trained more than 400 African workers. Three new instruction centres have recently been set up. The trained spinners and weavers are being encouraged to return to their own villages in order to spread the industry. The largest customers for the workshops' output during the year were the Polish camps in Uganda, which took £460 worth of woven goods.

324. AUSTRALASIA. QUEENSLAND: COTTON INDUSTRY, 1942-43. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1942-43.) The current season's crop started well, although shortage of labour handicapped the larger growers and prevented them from dealing effectively with the weed growth which developed as the result of a wet December. A considerable acreage of cotton was abandoned in consequence. Subsequently weather conditions varied in the different districts, but, writing in February, the Director of Cotton Culture thought that the general indication was that the average yield would be higher than that of last season, though the total acreage would be affected both by the labour position and the drive to produce more foodstuffs.

325. WORK AT THE COTTON RESEARCH STATION, BILOELA, 1942-43. By W. G. Wells. (*Prog. Rpts. from Exp. Stats.*, 1942-43.) The jassid-resistant cotton breeding programme has reached the stage where a slightly resistant Miller bulk selection, 41J, is being distributed commercially, while one pure Miller strain known as III-26 is being multiplied for distribution as a very jassid-resistant cotton. While displaying some defects in plant habit and boll size, the latter has shown itself in trials to be consistently prolific and resistant and to be uniform for most characters, including unfortunately a lint length of only $\frac{15}{16}$ to 1 inch. The fibre is very strong and full-bodied, while the lint percentage promises to be higher than that of commercial Miller. On present market requirements this type of lint would, however, command a ready sale. In addition there have been isolated, in the third generation after backcrossing, three hybrid strains with staple lengths of 1 inch and over, and all producing full-bodied, very strong lint with lint percentages on a level with that of commercial Miller—*i.e.*, 33·5 to 34·5 per cent. These hybrids, which are selections from (Mi × U.4) × Mi backcrosses, are very jassid-resistant, and while re-selection is being continued, they appear sufficiently uniform in essential characters to warrant testing extensively. Consequently two or three acres of each will be grown in isolation in the coming season to provide seed for full-scale testing and demonstration. The breeding plots proper yielded material of some interest. In the Miller plot, some groups of related progenies continued to show uniformity of plant type and lint characteristics within the family, combined

with jassid resistance. Some of these families appear more desirable types than III-26, and may replace it after adequate testing. III-26 has been so uniform that it is unlikely to respond rapidly to further attempts to improve it by individual plant selection, although this phase of the work is being continued. The Clett selections were again planted, this time with success. One progeny showed great uniformity for resistance, hairiness and plant type, the latter being extremely vegetative. The bolls were small, the lint appeared weak and wasty, and the strain shows little promise of yielding a commercial fibre. Since New Mexico Acala has been gaining in popularity on account of its production record and as the plant, boll, and fibre characters, with the exception of fibre strength, are better than those of Miller, it has been decided to incorporate this variety in the programme for breeding jassid-resistant types, for it has the disadvantage of being very jassid-susceptible. The variety is relatively constant phenotypically, and the difficulties caused by the heterozygosity of Miller should not occur in this project. It is proposed to use two resistant parents: the apparently immune Ferguson from Trinidad, and one of the Rhodesian strains. Ferguson, which is very late and vegetative under Callide Valley conditions, has been crossed with a Miller strain (fairly leafy and late) and the quick-maturing open Triumph variety so that its behaviour in crosses can be studied.

326. Trials of Rotations with Cotton at the Biloela Research Station. By W. A. R. Cowdry. (*Queensland Agr. Jour.*, January, 1944, p. 17.) The results of investigations conducted over several years appear to indicate that the beneficial effects obtained in a Rhodes grass-cotton rotation are due to the more permeable surface soil in the cultivations after ploughing a three years' stand of Rhodes grass. Efficient penetration of storm rains is thus secured, and this provides the cotton crops with sufficient moisture to withstand all but severe prolonged dry periods. In addition, a balance of plant foods more favourable for the production of profitable crops of cotton is maintained in the soil by this Rhodes grass-cotton rotation than in any of the other rotations tested.

327. The Value of Early Ploughing for the Cotton Crop. By W. G. Wells. (*Queensland Agr. Jour.*, March, 1944, p. 148.) Under Queensland conditions it is urged that cotton growers make every effort to plough for cotton during March or early April, and if possible use old grassland. If this is not available, then land that has been under either Sudan grass or giant setaria (giant panicum) may be used. In no circumstances should cotton be planted following either Japanese millet or white panicum, owing to the extra cultivation costs incurred as a result of the volunteer seedling growths from these crops.

328. Cotton Harvesting. By W. G. Steele. (*Queensland Agr. Jour.*, February, 1944 p. 75.) The paper, which is illustrated, deals briefly with hand picking, snapping, and baling.

329. Community One-Variety Cotton-Growing. By A. Nagle. (*Queens. Agr. J.*, April, 1944, p. 211.) It is suggested that wherever possible a group of cotton cultivators, with comparable conditions, should grow only the variety suited to their major soil types. By concentrating on learning how to grow to the best advantage the selected variety on their most suitable soil for it, the growers will get better returns than are realized when varieties are changed yearly, or a single variety is grown on every soil type on the farm.

330. Breeding Jassid-Resistant Cotton Varieties. By S. Marriott. (*Queens. Agr. J.*, October, 1943, p. 204.) A brief outline of the progress made by mass selection, individual plant selection, and by hybridization. The progress made in the last method has been found sufficiently satisfactory in developing promising jassid-resistant strains of the Miller type of cotton to warrant its expansion to include some other varieties. Accordingly, the New Mexico Acala and Triumph varieties have been crossed with the Ferguson variety as the first step in evolving jassid-resistant strains of these two important cottons. The Ferguson strain was received from the geneticist of the Corporation's Cotton Research Station in Trinidad.

331. WEST INDIES. THE IMPERIAL COLLEGE OF TROPICAL AGRICULTURE, TRINIDAD. In the report for the year ending December 31, 1943, it is stated that in spite of the many difficulties arising from the war the work of training and research continued without serious interruption. Research was continued on the important crops, banana, cacao, and sugarcane, and summaries are included on the investigations carried out by the Departments of Agriculture, Botany, Chemistry and Soil Science, Economics, Entomology, Mycology, and Sugar Technology. The number of students in residence showed a slight increase over last year, 43 as against 39 in 1942. The Associateship was awarded to twenty candidates, and the Diploma to four. Thirty scientific papers were published during the year, including those in "Tropical Agriculture." The following additions were made to the Library: parts of periodicals, 6,942; pamphlets 1,370; books purchased, 108; books presented, 12.

332. REPORT OF THE WEST INDIAN CONFERENCE. (Col. No. 187, H.M. Stat. Off., 1944. Price 6d. net.) In January of this year a joint communiqué was issued by H.M. Government in the United Kingdom and the Government of the United States to the effect that the two Governments had agreed to the inauguration of a regular system of West Indian Conferences under the auspices of the Anglo-American Caribbean Commission to discuss matters of common interest, and especially of social and economic significance, to the Caribbean countries. The report has now been issued of the first Conference, held in Barbados from March 21 to 30 last, under the chairmanship of Sir Frank Stockdale, Comptroller for Development and Welfare in the British West Indies and co-chairman of the Anglo-American Caribbean Commission. Mr. C. W. Taussig, the American co-chairman of the Commission, was also present. The report opens with lists of the delegates and advisers who attended the Conference, the members of the Anglo-American Caribbean Commission, and the members of the special committees. The detailed reports and recommendations are included of the seven committees appointed to consider and advise on the following items of the agenda after their preliminary discussion at public meetings of the whole Conference: I. Means for raising the nutritional level: Increased local food production. II. Means for raising the nutritional level: Expansion of fisheries. III. The re-absorption into civil life of persons engaged in war employment. IV. The planning of public works for the improvement of agriculture, education, housing, and public health. V. Health protection and quarantine. VI. Industrial development. VII. The Caribbean Research Council: Possibilities of its expansion. The resolutions passed at the Conference conclude the report.

333. AGRICULTURAL PROBLEMS OF THE WEST INDIAN COTTON INDUSTRY. By J. B. Hutchinson. (Emp. Cott. Grwg. Corpn., 1944.) Sea Island cotton is the most suitable cash crop for considerable areas in the British West Indian Islands. Its maintenance on a stable basis in the post-war economy is therefore of very great importance to those concerned with the welfare of the island communities as well as to those interested in assuring a steady supply of the finest cotton. The future success of the industry depends on three basic factors: the maintenance of the present high standard of uniformity in the produce; the control of pests and diseases; and the improvement of yield to give a satisfactory return in the face of increased competition from other fine cottons. At present the whole crop is produced from the following three varieties, all of which are closely bred and genetically very uniform: MSI (Leeward Islands), V.135 (St. Vincent), BSI (Barbados). The industry is dominated by the production of MSI in the Leeward Islands. Barbados production is of little account, and the Island's breeding work is on a minimum maintenance basis. The complete collection of Sea Island varieties now maintained in St. Vincent provides a reservoir of variability that will be the basis of any future breeding work. Though some features of pest incidence on Sea Island cotton remain to be elucidated, the main problems of control have been solved. These consist in the efficient carrying out of close season and clean-up regulations, prevention of the re-establishment of alternative stainer hosts, and prompt and thorough destruction of fresh invasions of cotton worm. In the past the greater part of the technical assistance given to the Sea Island industry has been devoted to the

improvement of the varietal situation and to pest control, and in consequence of the success of this work seed supply and pest control are now largely routine matters. Yield improvement by cultural methods has not received the same attention, but enough has been done to show the crying need for better farming systems, and the great opportunities that exist for agricultural betterment. The problem created by the pressure of expanding population on limited land resources has been emphasized by all who have studied the social conditions of the West Indies. The possibilities of relief offered by more intensive agriculture may be illustrated by the disparity in cotton yields between estate and peasant holdings in St. Vincent. Manning in 1943 reported that in the 1942-43 season the mean yield of lint from estate cultivations was 142 lb. per acre and from peasant cultivations 62 lb. per acre. When yields of 400 lb. per acre are by no means uncommon, the scope for improvement by better farming methods can be visualized. The exploitation of the possibilities of improved yields by better farming depends on the extension of the present knowledge of West Indian soil types, their rehabilitation where eroded, their conservation and amelioration by suitable cultivation methods, and their improvement with organic and mineral manures. The Sea Island crop is timed to mature in two different seasons. In most islands it is planted in August or September and ripens in the dry weather from January to April. The plant develops in an environment which is steadily becoming drier, and the sequence of vegetative and reproductive growth is normal. In general the cropping appears dominated by the nitrogen supply, and the major manurial problem is the maintenance of the optimum nitrogen level. In Montserrat and St. Kitts the crop is sown whenever suitable rains occur in the comparatively dry months of March and April, and it develops in an environment that gets progressively wetter, and the normal sequence of vegetative and reproductive growth is apt to be seriously upset, especially on the shoal soils with impeded drainage that comprise a large part of the cotton lands of Montserrat. Unless the fruiting phase is well established before the onset of heavy rains, the plant "runs to bush," "black boll" takes much of the crop that sets, extensive shedding occurs, and in extreme cases physiological diseases (chibble leaf, loggerhead) set in and lead to complete sterility of the upper branches. These physiological disturbances are often more severe on lands with a high nitrogen status, and under such conditions nitrogen manuring may be no more than a gamble on the weather. It is noteworthy that on the shoal soils of Nevis, with September planting, these physiological disturbances have not yet been reported. Though the obvious solution of the physiological problem would appear to be to change the planting season to September, there is no denying that, given a favourable weather sequence, Montserrat produces heavy crops, in spite of its large area of comparatively intractable shoal soil. Montserrat and St. Kitts, over a 23-year period ending 1941-42, averaged 184 and 191 lb. lint per acre respectively, against 123 lb., 111 lb. and 117 lb. per acre for Antigua, Nevis, and St. Vincent respectively. Evidently an understanding of the underlying factors governing the fruiting of Sea Island cotton might lead to a very large increase in crop yield.

Besides Sea Island cotton the West Indies also produce about 1,000 bales of perennial cotton in the Grenadines. This Marie Galante cotton might be a valuable asset if the industry were properly controlled. The establishment of a central ginnery has been sanctioned, and co-operative ginning and marketing are the first essentials if a good, clean, even running cotton is to be turned out. Replacement of the existing mixture of types can only be gradual with a perennial crop. Improvement is being sought by the compulsory eradication of the coarse *G. barbadense* component of the crop. A superior Marie Galante strain (AHV) is available, and only AHV seed is issued to supply the gaps caused by natural mortality and by the uprooting of *G. barbadense* plants. The basic problem of the Grenadines is soil erosion. In Carriacou in 1935 Evelyn recorded over 5,000 acres under cotton cultivation. In 1943 the area surveyed for the eradication of *G. barbadense* was little more than 3,000 acres. The reduction may be ascribed entirely to erosion, and the figures give an idea of the appalling rate at which the cultivable area is

shrinking. As with other West Indian islands, soil conservation can only be achieved by the adoption of a better farming system, the essentials of which are improved cotton cultivation, with regular replanting, a food crop rotation, and stock keeping.

334. Cotton Growing in the West Indies during the Eighteenth and Nineteenth Centuries. By S. G. Stephens. (*Trop. Agr.*, February, 1944, p. 23.) The purpose of this paper is to bring together data relevant to the cultivation of cotton in the West Indies in the eighteenth and nineteenth centuries, and extracts are given from various records mainly in the collection of the Historical Society of Trinidad and Tobago. Cotton was found growing in the West Indies in some abundance by the early Spanish settlers in the sixteenth century, but it does not appear to have attracted much attention for the next 100 years, tobacco and, later, sugar and indigo being the principal West Indian products until the end of the seventeenth century. The increased demand for cotton in the eighteenth century and the appearance in great numbers of the Sugar Ant caused a rapid change-over from cane to cotton. The pre-eminence of the West Indies in producing cotton for European markets lasted until the turn of the century, and at first it received no serious challenge from the Southern States of America. One of the chief limitations to expansion of cotton exports in the latter country was the type of cotton grown—viz., the green-seeded variety. Owing to its densely fuzzy seeds the lint could not be successfully removed by the roller gins then available, but had to be removed by hand. The naked and tufted seeded varieties grown in the West Indies (Shrub cottons) could, however, be readily delinted by roller gins. This advantage disappeared when Whitney patented the saw-gin in 1793, and from that date onward American cotton production soared, and West Indian production declined. In 1801 25,000 bales of cotton were shipped from the West Indies and by 1836 this figure had fallen to 20,000 bales. From that time cotton production rapidly diminished except for a short renewal during the American Civil War (1863-65), when cotton exports to Europe from the States were temporarily suspended. Only in the Grenadines did cotton growing persist into the twentieth century. The conclusions drawn from studies of the types of cotton grown indicate that there is no reason to suppose that perennial cottons found in the West Indies to-day differ from those cultivated in the eighteenth and nineteenth centuries. There is a strong possibility that *G. hirsutum* var. *Marie galante* formed the major constituent of the crops, particularly in those colonies which produced high-quality cotton.

COTTON IN THE UNITED STATES.

335. Agricultural Statistics, 1943. (U.S. Dept. of Agr. Obtainable Supt. of Documents, U.S. Govt. Printing Office, Washington, D.C. Price 65 cents [paper].) This is the eighth issue of this publication, prepared under the direction of the Yearbook Statistical Committee. It includes statistics of grains, cotton, sugar, tobacco, oilseeds, fats, oils, fruits, vegetables, melons, tree nuts, hay, seeds, and minor field crops; beef cattle, hogs, sheep, horses, mules; dairy and poultry statistics; farm capital and income statistics; agricultural conservation and adjustment statistics; miscellaneous agricultural statistics. A table of weights, measures, and conversion factors used in the Department of Agriculture is also included, and the volume is furnished with a useful index.

336. American Cotton: Harvesting and Handling have a Direct Bearing on the Spinning Quality. By F. L. Gerdes. (*Cotton*, M/c, 8/7/44.) Writing on this subject in an American journal the author states that " the practices which growers follow in harvesting and handling cotton have a direct bearing on the spinning quality and manufacturing performance of the ginned lint. The amount and type of foreign matter and the percentage of moisture in the seed cotton influence the grade and other qualities of the lint which, in turn, affect its spinning value, particularly from the standpoint of manufacturing waste. The extent of weather damage to the unpicked cotton in the field is directly related to the more important

spinning quality elements of the ginned lint, such as manufacturing waste and yarn strength and appearance. Loss in spinning value associated with weather damage is seldom recoverable. However, when cotton is picked and ginned in trashy or wet condition, the cotton can be so dried on the farm and cleaned and conditioned at the gin that the resultant lint will be cleaned and ginned smoothly enough to keep waste from being excessive when the cotton is manufactured. . . . Some of the results of tests carried out in the laboratories of the Cotton and Fibre Branch (U.S. War Food Administration) show that the field-exposed crop of cotton averaged lower than the timely harvested crop, in staple length by $\frac{1}{32}$ inch, in upper half mean length by 0·06 inch, and in tensile strength by almost 3,000 lb. per square inch. There appeared to be some evidence that weather damage caused a reduction in fibre length uniformity. The loss in grade and other adverse effects on fibre quality associated with weather damage increased manufacturing waste on an average of 4 per cent., or 20 lb. per bale. Losses in fibre length and strength resulted in an average reduction in yarn strength of 5·8 lb. with 22's, and 0·5 lb. with 60's yarns. Moreover, the weather-damaged crop produced yarns of significantly poorer appearance than those spun from the timely harvested crop of cotton."

337. AMERICAN TEXTILE INDUSTRY: FUTURE PROSPECTS. By D. G. Woolf. (*Text. Res.*, **14**, 1, 1944, p. 2. From *Summ. Curr. Lit.*, xxiv., **9**, 1944, p. 217.) A discussion of the outlook in the textile industry, the certainty of an increase in research in the near future, research in connection with the war effort and its influence on the type of textiles available after the war, problems of the textile industry in the immediate post-war period, new technical developments, textile raw materials of the future, the emergence of new finishes, the development of new equipment, and the economic outlook.

338. AMERICAN TEXTILE RESEARCH INSTITUTE. (*Text. Res.*, **14**, 1944, p. 66. From *J. Text Inst.*, July, 1944, A332.) The Textile Research Institute, Inc., has decided to establish headquarters for the prosecution of research and for the training of personnel on the graduate level, at Princeton, New Jersey. The President of Princeton University has declared that the University would afford the opportunity for members of the staff to enrol in graduate courses and proceed to advanced degrees. The programme of study and the research work would be arranged to the mutual satisfaction of the Graduate School and the Textile Research Institute.

339. INSTITUTE OF TEXTILE TECHNOLOGY, U.S.A. ORGANIZATION. (*Cotton*, U.S., **107**, 9, 1943, p. 78. From *J. Text. Inst.*, March, 1944, A135.) This new organization, established in August, 1943, " will engage in fundamental and applied research in the interests of the owners of cotton type spindles and/or looms." Membership is open to " American corporations whose principal investment is in cotton mill type machinery." The subscription is at the rate of 10 cents per spindle " in place," or 25 cents per bale of cotton or rayon staple (500 lb.) consumed in the 12 months previous to application for membership, or 0·05 cent per lb. of cloth produced in the previous 12 months.

340. FIELD CROPS. By H. C. Rather. (McGraw-Hill Book Co., London and New York, 1942. Price 26s. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 274.) This textbook deals with North American field crops and is intended principally for the use of agricultural students. The first five chapters are general in scope and the succeeding chapters deal with pasture and forage crops, cereals, pulses, sugar-cane, cotton, tobacco, roots, and finally crop improvement. To the non-American reader the interest of the book lies in the picture it gives of American methods of crop production and, not being too didactic, it can be recommended from this point of view. Accounts are given of the production of seed of herbage crops and, in the chapter on crop improvement, of seed certification schemes.

341. ARIZONA: FIFTY-SECOND ANNUAL REPORT OF THE AGRICULTURAL EXPERIMENT STATION, JUNE 1941. By R. S. Hawkins (Editor). (*Pl. Bre. Abs.*, xiv., **3**, 1944, p. 195.) Variety trials in 1940 showed that the varieties Delta and Pineland 44-51 out-yielded all others when grown in Upland regions, whilst Coker-Wilds 11 produced the longest fibre but the lowest yields. S × P yielded more heavily than the two other

American-Egyptian varieties, P-S × P (Earlipima) and Pima. 1,300 F_2 plants of the Pima-120 cross and 60 plants of the F_1 backcross (F_1 Pima × 120) × Pima, were grown with a view to selecting for a combination of fine lint, ability of the boll to hold the seed cotton, and productiveness. Crosses were made between the *G. barbadense* and Upland cotton hybrids on the one hand, and Hopi × Stoneville hybrids on the other, in an attempt to combine the disease resistance of the *G. barbadense* type with the good quality of the other forms. Strength tests on the Stoneville cotton grown on the Yuma Farm show it to be stronger than any other cotton tested. The F_6 of the Stoneville × Hartsville cross was grown, and selfed seed obtained from those lines which showed promise. The progeny of crosses between Santan and many other varieties have been tested with a view to selecting a type possessing better lint and spinning quality than that variety.

342. GEORGIA: COTTON VARIETY TESTS, 1943. By R. P. Bledsoe *et al.* (*Ga. Sta. Circ.* 144, 1944. From *Exp. Sta. Rec.*, **91**, 2, 1944, p. 150.) Tests at four locations in north Georgia and three locations in south Georgia during 1943 are tabulated, with averages for the period 1938-43. During the two-year period 1942-43, strains of Empire cotton led other varieties in money value, but with relatively small differences from the five varieties of Coker cotton. In three-year averages in south Georgia, Coker 100 Wilt appeared somewhat superior in yield and money value, had a fibre length of about 1 inch under most conditions, and was thought to be an improvement over other wilt-resistant varieties. Stonewilt 2, tested for only two years, appeared to be of about equal value. For Coastal Plain soils known to be wilt-free or lightly infested, Deltapine or Stonewilt is suggested.

343. "TIFTON STATION 21": A NEW COTTON FOR SOUTH GEORGIA. (Mimeogr. Paper, Ga. Coastal Pl. Exp. Sta., 1942, No. 15. From *Pl. Bre. Abs.*, xiv., **2**, 1944, p. 142.) Tifton Station 21 is a new cotton variety which originated as an individual plant selection from Dixie Triumph. It is a vigorously growing type suited to conditions in southern Georgia.

344. MISSISSIPPI: TESTS OF COTTON VARIETIES IN THE HILL SECTION, 1942. By J. F. O'Kelly, *et al.* (*Miss. Sta. Bull.* 386, 1943. From *Exp. Sta. Rec.*, **90**, 5, 1944, p. 617.) Varieties leading in value of production in tests at the station and substations included Acala 892, Bobshaw 1, Coker 100-5 and 100 Wilt, Delfos 531C and 651, Deltapine 12 and 14, Miller, and Stoneville 2B; on wilt-infested soil at the station Miller, Cleveland 54, Stoneville 2B and 8275, and Coker 100 Wilt; and in the test of standard and new varieties at the station Delfos 651, 531C, and 6466, Deltapine 14, Miller, and Stoneville 2B and 8275.

345. COTTON VARIETIES IN THE HILL SECTION OF MISSISSIPPI, 1943. By J. F. O'Kelly. (*Miss. Sta. Bull.* 396, 1944. From *Exp. Sta. Rec.*, **91**, 2, 1944, p. 151.) Yields obtained in tests at six locations in 1943 are tabulated, with averages for 1939-43. Hi-Bred led in lint percentage at all locations, and in pounds of lint per acre in all locations except Holly Springs, where it was exceeded by Acala 892 and Miller on the hill soils, and by Deltapine 14 and Stoneville 2B on the valley soils. Delfos 531 and Express 11384 led in staple length with $1\frac{5}{32}$ inch.

346. COTTON VARIETY TESTS IN THE YAZOO-MISSISSIPPI DELTA, 1943. By J. W. Neely and S. G. Brain. (*Miss. Sta. Bull.* 398, 1944. From *Exp. Sta. Rec.*, **91**, 1, 1944, p. 29.) In six variety tests conducted in 1943 at six points in the Yazoo-Mississippi Delta, the leading money value producers were Stoneville 2B, Stoneville 2C, and Deltapine 14, followed closely by Miller, Delfos 651, Rowden, and Bobshaw 1. The earliest varieties were Bobdel, and Delfos 444, 531C, and 651. Late varieties were Wilds 15, Rowden, and Deltapine 14. Outstanding in fibre strength were Wilds 15, Bobshaw 1, Bobdel, and Rowden. In regard to fibre length uniformity, Rowden, Miller, Bobshaw 1, Bobdel, and Deltapine 14 led the list.

347. PROFIT RETURNED BY MISSISSIPPI SOILS FROM ONE TON OF POTASH UNDER COTTON. By C. D. Hoover. (*Miss. Farm. Res.*, **7**, 1, 1944. From *Exp. Sta. Rec.*, **90**, 6, 1944, p. 735.) The greatest profit from 1 ton of potash for cotton was obtained on the terrace and bottom soils of the brown loam area, and the lowest return from the north-east prairie.

348. NORTH CAROLINA: COTTON-RAISING COUNTIES LOSE MANY NEGRO TENANTS. (*N. Car. Sta. Rpt.*, 1942. From *Exp. Sta. Rec.*, **90**, 6, 1944, p. 846.) Of a total decrease of 15,143 negro tenant farmers in the State between 1930 and 1940, a decrease of 11,696 occurred in the so-called cotton counties. The conclusion is that conditions in the cotton market have been the most important factor in causing the exodus of negro tenant farmers.

349. INFLUENCE OF SOIL TREATMENT FOR PEANUTS ON COTTON IN A COTTON, PEANUT, LEGUME ROTATION. By J. J. Skinner *et al.* (*Com. Fert.*, **64**, 4, 1942. From *Exp. Sta. Rec.*, **90**, 5, 1944, p. 591.) Norfolk very fine sandy loam, Ruston loamy sand, Wickham sandy loam, and Dunbar-Lenoir fine sandy loam in North Carolina were studied to determine the effect of soil treatments for peanuts on cotton grown in the rotation. Growth and yield of cotton were found to be affected when grown in rotation with peanuts, even though additional fertilizer is applied when the cotton is planted. Other experiments with winter legumes and chemical nitrogen differentials show that the yields of cotton and peanuts may be economically maintained with a reduced amount of commercial nitrogen if winter legumes in addition to summer legumes in the rotation are grown for ploughing under.

350. OKLAHOMA: COTTON CROP, 1943-44. (*Curr. Farm. Econ.*, April, 1944, p. 37.) The staple of Oklahoma cotton averaged between $\frac{1}{32}$ and $\frac{1}{16}$ inch shorter for 1943-44 than for the preceding season, largely because of the hot dry weather. The grade index average was 94·4 (Middling White equals 100) compared with 89·8 in 1942-43, mainly because of the favourable weather for harvest and in spite of labour shortage.

351. COTTON INDUSTRY, 1943-44. (*Curr. Farm. Econ.*, February, 1944.) Prices paid for picking and snapping the 1943-44 cotton crop were the highest in the last twenty years for the whole Cotton Belt. In Oklahoma the increase was 45 per cent., the average price paid in the state being $1.95 per 100 lb. seed cotton.

352. PHILADELPHIA TEXTILE INSTITUTE: RESEARCH WORK. By H. W. Rose. (*Text. Res.*, **14**, 1944, p. 42. From *Summ. Curr. Lit.*, xxiv., **10**, 1944, p. 243.) The dual objectives of research—knowledge and education—and the value of applied research in textile schools are discussed, and a brief account is given of the research work being carried out in the Philadelphia Textile Institute. Industrial problems are brought to the Institute by manufacturers, mills, factors in the trade, and by the Government.

353. SOUTH CAROLINA: EFFECT OF ADDING SODIUM TO THE FERTILIZER ON COTTON. By H. P. Cooper and W. H. Garman. See Abstract 387.

354. TEXAS: SUCCESSFUL CO-OPERATIVE COTTON GIN ASSOCIATIONS. By W. E. Paulson. (*Bull.* 636. Texas Agr. Exp. Sta., 1943.) The co-operative cotton gin associations gin from 20 to 25 per cent. of the Texas cotton crop. Ten years ago the state had 75 co-operative gins; to-day the number is 375, a five-fold increase in a decade. Less than 20 per cent. of these associations are outstandingly successful; a large percentage have not attained a satisfactory level of efficiency. A historical sketch of the co-operative gin movement in Texas is included in this bulletin to emphasize the difficulties and problems that had to be overcome before co-operative gin associations could be perfected. A detailed analysis is given of four successful co-operative gin associations in the State.

355. INVESTIGATIONS IN EROSION CONTROL AND RECLAMATION OF ERODED LAND AT THE BLACKLAND CONSERVATION EXPERIMENT STATION, TEMPLE, TEXAS, 1931-41. By H. O. Hill *et al.* See Abstract 385.

356. COTTON SEED TREATMENT STUDIES AT THE BLACKLAND EXPERIMENT STATION. By C. H. Rogers. See Abstract 394.

357. VIRGINIA MILLS INSTITUTE OF TEXTILE TECHNOLOGY: ESTABLISHMENT. (*Sci.*, **99**, 1944, p. 342. From *Summ. Curr. Lit.*, xxiv., **15**, 1944, p. 376.) An Institute of Textile Technology has been established at Charlottesville, Virginia, by trustees representing 28 textile mills in the East (U.S.A.). Its purpose is to maintain an educational institution and to promote scientific research and processes related to the textile industry. The charter provides that none of its profits shall go to any member or individual, and expressly prohibits the use of propaganda designed to influence legislation.

COTTON IN EGYPT.

358. Egypt: Cotton Ginned from the Crop of 1943-44. (*Cotton*, M/c, 12/8/44.) The final official ginning returns of the Egyptian cotton crop of 1943-44 give the total at 3,570,492 kantars, against 4,240,271 kantars in the previous season. There were some big changes in outturn of the different varieties: Karnak amounted to 1,731,000 kantars, compared with only 759,000 kantars in 1942-43, and Menoufi to 64,000 kantars, but there were substantial reductions in other leading types. The Ashmouni crop amounted to 799,000 kantars, against 939,000 in the previous season, that of Giza 7 was 683,000 kantars, against 850,000; Malaki 99,000 kantars, against 212,000; and Maarad 38,000 kantars, against 159,000 kantars. The average yield per feddan decreased from about 6 kantars in 1942-43 to about 5 kantars in 1943-44, but against this setback there was a further improvement in the average grade of the cotton grown. In 1943-44 the highest proportion of the crop fell into the grade Good-Fully Good, which accounted for 25 per cent. of the total, with Fully Good and Good each accounting for 24·3 per cent. In 1942-43 the highest proportion was graded as Good with 27·8 per cent., Good-Fully Good amounting to 21·9 per cent. and Fully Good to 23·2 per cent. This improvement has been proceeding continuously for some seasons, and has been brought about partly by the planting of better varieties of cotton and partly by reduction in bollworm attack.

359. Egypt: Cotton Industry, 1944-45. (*Cotton*, M/c, 24/6/44.) Private reports on this year's cotton planting in Egypt indicate that the area is slightly larger than last year. In Upper Egypt Ashmouni has been planted almost exclusively, while in Lower Egypt Karnak is the principal variety; Sakellaridis has been abandoned.

360. Egyptian Cotton: Prices. (*Man. Guar.*, 22/8/44.) It is reported from Cairo that the Egyptian Government has decided to offer to buy cotton of the 1944-45 crop at prices about 20 per cent. higher than those at which it bought cotton of the previous crop. The prices will be on the basis of \$29 for fully good fair Ashmouni, against \$24 for the 1943-44 crop, and \$36 for the same grade of Giza 7, against \$30. Claims for higher prices for this year's crop have rested mainly on four considerations. It is stated that all the items in the cost of production—seed, fertilizer, labour, etc.—are higher by anything from 20 to 50 per cent. compared with last year, and that the cost of living has also increased. Prices received for the last crop in the free market at Minet el Bassal, it is pointed out, have been \$5 to \$8 per kantar above the Government's buying prices, while the prices received for similar cottons in the United States are substantially higher than they were a year ago. Another consideration which is put forward in support of the claim for higher prices is the position of the farmer under Egypt's present policy of agriculture. The area which may be used for growing cotton is strictly limited, and land has to be used instead for growing food crops, such as wheat, maize, and rice, to maintain domestic supplies in order to counterbalance the curtailment of imports. The prices received for these food crops, it is argued, do not cover the costs of production, and while there may be good reasons for keeping the prices of foodstuffs for internal consumption at these low levels, the position of cotton is different. It is suggested accordingly that the prices offered for cotton should be high enough to compensate farmers for their losses on food crops.

361. Egyptian Cotton: Supplies and Classification. By H. A. Hancock. (*Text. Merc. and Argus*, **110**, 1944, pp. 33, 45. From *J. Text. Inst.*, March, 1944, A89.) The distribution of Ashmouni, Zagora, Giza 7, and Karnak+Malaki cottons by grade and the amounts of these and other Egyptian cottons produced in recent years are tabulated, and the present position of stocks is discussed.

COTTON IN OTHER FOREIGN COUNTRIES.

362. Argentina: Cotton Plant: Experimental Work in Argentina, 1942. (*Bol. Mens.*, 97-98 and 99-100. Junta Nac. del Algodon, 1943. From *Summ. Curr. Lit.*, xxiv., **8**, 1944, p. 169.) (1) A detailed account of the work on cotton carried

out in 1942 at the Experiment Station, Las Breñas, Chaco. This work included variety trials with twenty varieties of cotton, the breeding of improved strains of Farm Relief, Coker 100, Deltapine, Stoneville and other cottons by selection, the study of various hybrids, multiplication of Las Breñas, a selected strain of Coker 100, and studies of time of sowing, spacing of rows and plants, methods of cultivation, spraying with Frutone, and the occurrence and control of insect pests. (2) A report of climatic conditions in the 1941-42 season and of the work carried out in La Banda Experiment Station. The work included spacing and time of sowing experiments, comparative tests of 21 varieties of cotton, breeding by selection, multiplication of selected strains of Juntalgodon Brebbia, Stoneville 5, Chaco, Carolina Foster, and Texacala cottons, and studies of methods of improving nitrous and alkaline soils.

363. Boletin Mensual. (Min. de Agr., Junta Nac. del Algodon, Buenos Aires, Argentina, 1943.) *Bulletins* 99-103 contain the following among other papers in Spanish: "Cotton in the post-war period" (R. Garcia-Mata); "The function of cotton in post-war plans" (P. Molyneux); "Cotton mill activity in Argentina in 1942, and the consumption of raw cotton" (P. A. Cavadini); "The industrialization of cottonseed in 1942" (J. A. Gonzalez); "Possibilities of the textile industry of Latin America after the war"; "The results obtained in cotton selection work carried out at the La Molina Experiment Station, Peru" (A. Verdejo). Statistics are also included of acreage, production, prices, exports, etc.

364. Belgian Congo: Meteorology and Cotton Culture. (In French. From *Bull. Agr. du Congo Belge*, xxxiv., Nos. 1-4, 1943, p. 5.) A discussion of the optimum date for planting cotton in the region north of the Belgian Congo. The three chapters of the article deal with (1) Meteorology of the northern region; (2) The date for planting cotton; (3) The germination of cotton seed. Many statistical tables are included.

365. Brazil: Cotton Industry, 1943-44. (*Bd. of Tr. J.*, 15/4/44.) The second official estimate of the 1943-44 cotton crop in North Brazil is given as 90,200 tons. This estimate is much higher than the 1942-43 crop, which is now officially returned at only 78,600 tons, compared with 101,500 tons in 1941-42. Irregularity of rainfall and the drift of labour to other activities were considered mainly responsible for the decline in the 1942-43 season.

366. Finance of 1943-44 Cotton Crop. (*Cotton*, M/c, 15/4/44.) According to a Reuter's message the Bank of Brazil has been authorized to finance the 1943-44 Brazilian cotton crop on the basis of 66 cruzeiros per 15 kilos, under a decree issued by President Vargas.

367. French Morocco Cotton Production. (*Cotton*, M/c, 29/4/44/.) According to recent reports received from the U.S. Office of Foreign Agricultural Relations cotton production is increasing in French Morocco. It is estimated that the 1943-44 crop will amount to some 5,300 bales from about 7,710 acres. This is a noticeable increase from the acreage and production figures of 1937-38, when about 230 bales were produced on 642 acres. Prior to 1937 land planted to cotton amounted to less than 250 acres. Moroccan cotton is of the long-staple type, and is thought to be a derivative of the Egyptian strains. In pre-war years Moroccan cotton realized a premium on the market over Egyptian varieties, due to its high quality and fairly consistent long staple.

368. Mexico: Cotton Industry. (*Cotton*, M/c, 15/4/44.) The Mexican Ministry of Finance has authorized the importation of 91 metric tons of cottonseed. The seed will be planted in the Laguna district, Mexico's principal cotton zone, and in northern Baja California territory, on the California border.

369. Peru: Cotton Crop, 1944. (*Bd. of Tr. J.*, 15/7/44, p. 260.) According to the Bank of London and South America Ltd., London, it is estimated that the 1944 cotton crop should approximate 65,000 tons.

370. Memoria Anual de 1941 del Jefe del Departamento de Investigaciones de Algodon y Cereales. By T. Boza Barducci *et al.* (*Est. Exp. Agr. de la Molina*,

Lima, Peru. In Spanish, with English summary. Received June, 1944.) *Cotton.*—Results of selection work carried out during 1940-41 are reported, and show by means of tables and graphs the progress made in connection with the improvement of the most important characters of Tanguis cotton, and on the increasing resistance of this cotton to *Verticillium* wilt. Twenty-three graphs are included showing variations observed in nine important characters in a lot of 91 strains tested in progeny rows. Six purity chequer correlation graphs of three pairs of characters give data concerning 32 progenies of the strain LM No. 7-35 from the Tanguis variety, now under multiplication, and 34 progenies of the type CN-LM, a very promising group of Tanguis selections. Special study has been made of the character of "earliness" in cotton, since this is of importance to growers in connection with insect attacks. Interlineal, intervarietal and interspecific crosses with cotton are described, and some promising material is under test. Results of cytological and cytogenetic investigations are also reported. During the season 106,357 lb. of pure seed from the Tanguis strain LM No. 7-35 were sold to cultivators for planting purposes.

371. PORTUGUESE EAST AFRICA. A new cotton research station has recently been established in Mozambique by the Portuguese Government under the title of the "Centro de Investigacao Cientifica Algodoeira" (CICA). The Director of the Station is Prof. Dr. Aurelio Quintanilha.

372. RUSSIA: SOME RESULTS OF SCIENTIFIC WORK DURING A YEAR OF WAR (1941). By N. Avdonin. (*Soc. Selskoe Hozjaisto*, 6-7. Moscow, 1942. From *Pl. Bre. Abs.*, xiv., **3**, 1944, p. 190.) The State Cotton Institute has produced varieties of wilt-resistant cotton plants and also forms with green, russet, light and dark brown fibre which need no dyeing when made up into textile materials.

373. KACHESTVO SOVETSKOGO KHLOPKA (QUALITY OF SOVIET COTTON). By V. V. Laikov. (Editor). (*Moskva. Tsentral'nyl Nauchno-Issledovatel'skii Inst. Khlop. Promyshlennosti*, 1939. From *U.S. Dpt. Agr., Liby. Bibliog. of Agr.*, **4**, 5, May, 1944. Item 17242.) Contents (in Russian): "New varieties of Soviet cotton" (V. V. Laikov); "The quality of Sea Island cotton" (M. M. Moiseenko); "On the difference in firmness of American and Egyptian cottons" (A. N. Boiarkin); "Quick method of determining cotton moisture by an electrical apparatus" (S. I. Shchegolev); "Analysis of cotton for impurities" (A. G. Feofilov); "Cotton fibre cleaning machine" (S. I. Shchegolev); "Increasing the productivity of gins and its effect on cotton quality" (V. V. Laikov).

374. COTTON PRODUCTION IN THE FERGHANA VALLEY. By G. Kublitsky. (*Cotton*, M/c, 29/7/44.) From this paper received by *Cotton* from the Secretary of the Press Service Department of the Soviet Embassy, London, we give the following extracts: "The high yields obtained on the cotton plantations of Soviet Russia before the war were attracting considerable attention. The development of the Ferghana Valley can perhaps serve to illustrate this success. The Ferghana Valley stretches from west to east for about 300 kilometres, and is half as wide as it is long. Mountain ranges, towering in places to 20,000 feet, protect it from the winds. In these mountains, situated on a latitude south of that of Sicily, the climate is more severe than that of the shores of the Arctic Ocean, but the valley itself is climatically in many respects akin to that of the Nile Delta. . . . Water is the foundation of the valley's prosperity. It has been established that irrigation systems existed in Ferghana in the eleventh and twelfth centuries. Special investigations have been made of the Sultan-Jab canal, as a model irrigation work subject to the minimum of silting. The ancient Uzbuk engineers were familiar with the use of subterranean reservoirs and the water-raising wheel. But the broad development of irrigation in the Ferghana Valley began in the past two decades. A big advance was made in 1935 when the Soviet Government initiated large-scale measures to raise the yield of the irrigated cotton plantations of Central Asia. Extensive land reclamation work was undertaken, and reached particularly large dimensions in 1939-40, when, on the initiative of the local population and with the support of the Government, the Lyagan Canal, 32 kilometres long, was dug,

followed by the huge Grand Ferghana Canal, whose length exceeds 270 kilometres. . . . Numerous branches of the canal brought fertility to those patches of desert which still remained in the Ferghana Valley. In this way an abundant water supply was made available for cotton growing. The 36 different varieties of cotton hitherto planted in the valley were replaced by 14 standard strains of long fibre and high yield, which had been developed by the Soviet plant breeders. At the same time the one-crop system, which exhausts the soil, was abandoned for a two-crop rotation, by which cotton was alternated with lucerne, which replenishes the soil with the nitrogen needed for successful cotton growing. Incidentally, five crops of lucerne can be harvested in the Ferghana Valley annually. Chemical fertilizers also began to be used on a far greater scale than before. This fight for larger cotton crops was supported by the Government, which supplied the necessary finances, and also sent to Central Asia consignments of specially adapted tractors and tractor-drawn implements as well as agricultural experts. The prime factor which made these large-scale Government and public efforts to increase cotton yields possible was the collective farm system which enabled means of production to be pooled, machinery to be employed, and scientific methods to be adopted on a scale inconceivable on small, individual farms. . . . An instance is recorded of one of the Ferghana Valley collective farms securing an average yield of 29 metric centners of Egyptian cotton per hectare. The farmers ploughed the land with tractors four times—once in the autumn and three times in the spring. Seeding was done with tractor-drawn drills. After the shoots appeared the fields were weeded twice by hand. Tractor cultivation was followed by hand hoeing. The plantations were irrigated eight times—once in the winter, once in the spring and six times during the vegetation period, the water being run through furrows in between the rows. Fifteen tons of manure and 800 kilograms each of phosphorus and nitrogen fertilizer per hectare were spread. Furthermore, the method of "clipping" recommended by the Soviet horticulturist, Trofim Lysenko, was employed with the view of curtailing the length of the non-fertility branches and encouraging the growth of the boll-bearing branches.

375. South America: Colombia: El Laboratorio Tecnologico de Fibras Textiles en la Exposicion Nacional de Medellin (The Technological Laboratory for Textile Fibres in the National Exhibition of Medellin). By R. Pedraza. (Pubn. of the Min. de la Econ. Nacional, Bogota, Colombia.) A brief illustrated account dealing with the cotton technology, commercial classification, spinning, and weaving sections of the Laboratory.

376. Spain: Cotton Cultivation. (*Text. Merc. and Argus*, **110**, 1944, p. 289. From *Summ. Curr. Lit.*, xxiv., **7**, 1944, p. 147.) Production of cotton in Spain reached 19,666 bales in 1942, but the capacity of the country is said to be six times this amount. There is an Institute for the Furthering of Textile Fibre Production, and the Government Cotton Service is to promote the use of large tracts of land that will require irrigation.

377. Spanish Textile Industry: Development. (*Times Tr. and Eng.*, **54**, 1944, p. 18. From *Summ. Curr. Lit.*, xxiv., **10**, 1944, p. 243.) According to statistics published by the Spanish Textile Syndicate, production of fabrics in 1943 amounted to 392,500,000 metres, an increase of 75,000,000 m., compared with 1942. This total consisted of 300,000,000 m. cotton fabric, 48,000,000 m. silk and 44,500,000 m. woollen fabric. About 11,430 enterprises, employing about 450,000 people, are engaged in the textile industry. In 1940 production of cotton amounted to over 10,000 bales, and in 1942 to 19,666 bales, and it is hoped that the figure for 1943 will be similar to that of 1942. The production possibilities of Spain have been estimated at 120,000 bales.

SOILS, SOIL EROSION, AND MANURES.

378. Soil Science and its Practical Application. By D. H. Doane. (*Soil Sci., Amer. Proc.* 7, 1942. From *Exp. Sta. Rec.*, **90**, 3, 1944, p. 302.) A general paper based on the past contributions and future responsibilities of soil scientists for the building of a better world, presented before the annual meeting of the Soil Science Society of America at St. Louis, Mo., in November, 1942.

379. Soil Structure. By W. S. Martin. (*E. Afr. Agr. J.*, April, 1944, p. 189.) The terms "texture," "structure" and "tilth" are re-defined. Laboratory means of assessing actual and potential crumb percentages are given. The use of the grass rotation and its practical application are discussed.

380. Soil Colloids. (*Trop. Agr.*, June, 1943, p. 124.) That fraction of the soil which is designated by the term "colloids" is recognized as the seat of many reactions which take place within the soil. Some knowledge of that fraction is therefore of great importance to the student of soil science. In a paper on this subject by H. J. Atkinson (*Sci. Agr.*, **23**, 5, 1943) a review is presented of some of the theories on the formation, structure and behaviour of the soil colloidal complex. The author states in the summary to his paper: "On the assumption that the inorganic colloidal material of a soil is formed by the chemical weathering of original rock minerals, chiefly by means of hydrolysis, Brown and Byers have outlined some hypothetical reactions to explain the formation of different clay minerals such as montmorillonite, halloysite, etc., which are found in the clay fractions of soils, and these reactions are presented. The crystalline nature of the inorganic soil colloids is briefly discussed, together with an outline of the evidence on which the theories regarding their structure are based. Reference is made to the work of Mattson, who concludes that the soil colloids are formed by mutual precipitation, at or near isoelectric conditions, between electro-positive or basic sols on the one hand, and electro-negative or acidic sols on the other. The properties of soil colloids are believed to depend to a large extent on the relative proportion of these constituents in the colloid. Mention is also made of Tiulin's study of the organic-mineral gels, in which he outlines a method of separating soil colloids into electro-negative colloids and isoelectric colloids, and of further fractionating each of these groups. It is believed that this method may prove useful in the study of a number of soil problems."

381. Four Years' Experience with a Soil Penetrometer. By B. T. Shaw *et al.* (*Soil Sci. Soc. Amer. Proc.* 7, 1942. From *Exp. Sta. Rec.*, **90**, 3, 1944, p. 302.) The penetrometer used is described in detail, and drawings showing manner of construction are presented. Penetration curves obtained with the instrument are presented for several different conditions of tillage and land cover.

382. Stability of Soil Crumb in Uganda Soils. (*Soils and Fertilizers*, vi., 4. From *Trop. Agr.*, May, 1944, p. 100.) Water-stable crumbs exceeding ½ mm. size were found to be efficient indication of soil structure and consequent inherent fertility. The Tiulin technique was applied to a number of fertility experiments, and indicated that farmyard manure merely feeds the crop and has no effect in re-forming the structure of the soil. In the experiments where resting periods are included it was found that resting under grass regenerates the fertility of the soil by building up the crumb structure to a high level before cropping. It was possible to construct a tentative empirical scale showing the relation between the percentage of particles over ½ mm. and the fertility level of the soil. In Buganda, red loam soils which had rested under elephant grass attained about 60 per cent. of these crumbs; in the short grass areas, well-rested silt loam soils attained about 40 per cent. These percentages declined steadily with cultivation, falling as low as 30 per cent. after continuous cultivation in both areas and 20 per cent. if the destructive process is assisted by erosion. These results provide for the first time proof that, under local conditions, the resting period under grass does regenerate the structure of the soil, and that manure does not, thus supporting the earlier field observations which led to the adoption of the grass resting period in 1934.

383. Two Devices for Measuring Soil Erosion. By W. D. Ellison. (*Agr. Eng.*, **25**, 2, 1944. From *Exp. Sta. Rec.*, **91**, 1, 1944, p. 17.) A rain splash sampler and an overland flow sampler are described. The first of these devices consists of two catch pans used back to back, each being made $3\frac{3}{4}$ inches deep, with an opening 6 inches long and $\frac{1}{2}$ inch wide, the edges flanged or lipped, and the back continued above the opening to form a splash board 5×6 inches. Of these sampling pans, two are set back to back in a collecting tank $5\frac{1}{2} \times 6\frac{1}{4} \times 1\frac{1}{2}$ inches with a watertight metal septum. The surface flow sampler consists essentially of a narrow channel through which the sample is collected, provided with deflection fins and mounted upon a base or floor capable of being adjusted to the slope. The use of such instruments is briefly discussed.

384. Terracing for Soil and Water Conservation. (U.S. Dpt. Agr., *Farmers' Bull.* 1789. From *Trop. Agr.*, April, 1944, p. 80.) This bulletin brings up to date information on methods of terrace construction and maintenance. Special consideration is given to the place of terracing in the general erosion-control programme. The results of investigations of soil and water losses from terraces on different soil types at the soil and water conservation experiment stations are considered in relation to the terracing programme. Methods of construction of the different types of terraces are well illustrated.

385. Investigations in Erosion Control and Reclamation of Eroded Land at the Blackland Conservation Experiment Station, Temple, Texas, 1931-41. By H. O. Hill *et al.* (*U.S. Dpt. Agr. Tech. Bull.* 859, 1944. From *Exp. Sta. Rec.*, **91**, 2, 1944, p. 130.) Presents the results of ten years of work in the determination of the cause of soil erosion and the development of soil and water conservation practices at the Blackland Soil and Water Conservation Experiment Station, Temple, Texas. During the period of the investigation the control plat planted continuously to cotton lost 226 tons of soil per acre. Three rainstorms caused 27 per cent. of this loss and fourteen storms accounted for 52 per cent. of the total soil loss. The amount of soil loss is influenced by the intensity of the storm, the antecedent rains, the presence of or absence of plant cover, and the physical condition of the surface soil. Rainfall on a wet, tightly compacted soil caused almost five times greater loss than one of similar amount and intensity falling on a moist, loosely packed surface. A moderate rainfall of high intensity falling on dry loose soil that had been subjected to flat cultivation produced much higher run-off and soil loss than a similar rain falling on similar soil that had been left in a cloddy moist condition. These records, together with other experimental data, furnish ample evidence of the fact that modifications of cultural practices can be made to play an important part in the management of the soils of the Texas Blackland area. Established plant cover, such as Bermuda grass, was the most effective means of reducing run-off and controlling erosion. Of the cultivated plants, oats have given effective protection, due largely to the fact that this crop is at its maximum growth period during the spring months when protection is most needed. . . . Field plat data show that crop rotations containing small grains are effective in reducing soil and water losses, and that this saving is greatly enhanced by strip cropping when the proper sequence is followed. Further data indicate that the combination of strip cropping with terraces is slightly more effective than either of these soil-conserving measures used alone. . . . The problems of soil conservation involve the rebuilding of severely eroded areas as well as the reduction of soil losses. Results from this station have shown that, in general, Blackland soils respond satisfactorily to additions of organic matter. Hubam clover and selected strains of cowpeas offer possibilities for soil-building purposes, 1 year's results on eroded Austin clay showing an increase in the yield of cotton following Hubam clover as compared with cotton after corn. The yield of corn after Hubam clover was about the same as corn after cotton. Experience has shown that land too severely eroded to remain in cultivation can best be utilized in this area by re-vegetation to grasses. One hundred and twenty species of grasses are under observation at the station to determine the possibilities for their use in soil conservation.

386. Relation of Fertilizers to the Development of the Cotton Aphid in 1941 and 1942. By R. L. McGarr. See Abstract 409.

387. Effect of Adding Sodium to the Fertilizer on Cotton. By H. P. Cooper and W. H. Garman. (*Amer. Fert.*, **100**, 1, 1944, p. 9. From *Exp. Sta. Rec.*, **91**, 1, 1944, p. 18.) Data are presented on the comparative yield of seed cotton at the Sandhill Substation, South Carolina, on Norfolk loamy soil at different levels of potash fertilization when sodium was added to the fertilizer. A progressive percentage decrease in yield of seed cotton was obtained from the use of sodium coincident with the increase in rate of potash fertilization. Where no potash was applied, the addition of sodium increased the yield 215 lb. of seed cotton per acre, or 70·3 per cent.; whereas with 60 lb. of potash the increase from the use of sodium was 182 lb., or 15·1 per cent.

388. Humus. (*Soils and Fertilizers*, vi., **3**, 1943. From *Trop. Agr.*, July, 1944, p. 139.) F. Yu. Geltser has strongly criticized the commonly held view of humus (or humic acid) as a product of the decomposition of plant materials and of lignin in particular. He points out that the only similarities between humic acid and lignin are that both are soluble in alkali, forming coloured solutions. Humic acid is, however, sharply distinguished from all lignin-like substances and from products of plant decay by its ability to unite and form stable complexes with certain mineral colloids. This property of forming the organo-mineral complexes described by A. F. Tiulin and characteristic of all mineral soils is not possessed by any other known class of organic compound. Geltser postulates that humic acid is formed from the products of plant decay by a quite distinct process of synthesis performed by micro-organisms, and that it has no genetic relationship with any of the recognized plant constituents. L. Meyer has advanced the hypothesis that the formation of organo-mineral colloids takes place *in statu nascendi* by the union of humic acid in process of synthesis with micaceous or montmorillonitic colloids in process of formation from primary rock minerals. Geltser asserts that there are two distinct types of humus, one occurring in considerable proportions in chernozems and cultivated soils, the other in podzols, peats and acid soils generally. He ascribes the formation of the former to the action of bacteria and of the latter to the action of fungi, thus bringing his theories into line with those of W. R. Williams. A distinction according to physical and electro-chemical properties between humic acid from peat and fertile soil, respectively, is also made by Springer. A. I. Natkina found a considerable difference in the elementary composition of the two kinds of humic acids, and concluded that the process of oxidation and dehydration had reached a relatively more advanced stage in chernozem humic acid. I. D. Sedletsky and G. V. Shimakova, on the other hand, pointed out that the similarity in behaviour on heating of humic acids from both peats and soils testified to their identical structure, the thermal investigations thus confirming the evidence of electronographic and X-ray analysis. W. S. Gillman found the humic acids from three contrasting soil-types similar in chemical and physical properties. The non-nitrogenous fraction of humic acid appeared to consist of a slightly modified lignin complex. F. Scheffer fractionated chernozem humus into a readily decomposed "nutrient" humus and a "permanent" humus which has important physico-chemical effects on the soil. The ratio of the latter to the former in chernozems is about 3 to 1. The aim in making manure is said to be the conversion of as much lignin as possible into permanent humus, the process being aided by mixing the organic material with soil and lime. C. Enders has put forward a theory that humic acid is formed by the condensation of amino-compounds with methyl-glyoxal produced from carbohydrates. Lignin is supposed to be formed in plant tissue in an analogous way.

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, AND GINNING.

389. The Recovery of Inter-Block Information in Incomplete Block Designs. By K. R. Nair. (*Sankhya*, **6**, 4, February, 1944, p. 383.) In agricultural field experiments it has been found that, unless the field is very heterogeneous, the adoption of incomplete block designs leads to inefficient estimates of treatment differences, if the whole of the apparent block differences is eliminated from such estimates. When the fertility differences between blocks are not big, the efficiency of the estimates of treatment differences can be improved by pooling the intra-block and inter-block information. The process of doing this has been worked out in this paper for partially balanced incomplete block designs, of which the quasi-factorial and confounded designs are special cases. The situation when some plots of these designs are missing has also been discussed.

390. Influence of Humidity and Temperature on the Yield of Cotton. By K. R. Nair and P. K. Bose. (*Sankhya*, **6**, 4, February, 1944, p. 350.) A paper presented before the Sixth Session of the Indian Statistical Conference, Calcutta, 1943. The method of regression integral developed by R. A. Fisher to study the influence of a single meteorological factor on the yield of a crop has been extended to study the combined influence of two or more meteorological factors. The method has been applied to a concrete problem of determining the effect of daily changes in humidity and temperature on the normal yield of cotton in a certain province of India.

391. Packing of Cotton at Gins for Uniform Density. By L. J. Watson and V. L. Stedronsky. (*U.S. Dpt. Agr., Misc. Pubn.* 527, 1943. From *Exp. Sta. Rec.*, **90,** 3, 1944, p. 399.) The authors take up first such problems arising from uneven packing of bales as wear and tear on gin equipment, compression difficulties, inconvenience in handling, shipping, transportation, and storage. They then consider sources of uneven packing and means of elimination, such as big-ended bales and the use of the lint-flue deflector and proper care of the condenser to prevent them, heavy-sided or rolling bales and regulation of kicker speed to prevent them, and dog ridges and modification of the dog mechanism to eliminate them. Heavyweight bales as a factor in uneven packing and pressing difficulties are dealt with also.

COTTONSEED AND OIL.

392. Studies on the Preservation of Seeds. I. Respiration of Cottonseeds under Various Relative Humidities. By C. M. Franco. (*Bragantia*, **3**, 6, 1943, p. 137. In Portuguese. From *Exp. Sta. Rec.*, **91**, 2, 1944, p. 139.) In studies of cottonseeds subject to relative humidities of 10 to 100 per cent., respiration became noticeable above 80 per cent. Seeds held under relative humidities of 0 to 90 per cent. had moisture contents of 1·1 to 20·97 per cent.

393. Determination of Free Gossypol in Cottonseed Meal: A Colorimetric Method. By C. M. Lyman *et al.* (*Indus. and Eng. Chem., Analyt. Ed.*, **15**, 8, 1943, p. 489. From *Exp. Sta. Rec.*, **91**, 1, 1944, p. 11.) The gossypol is removed from a 2-gm. sample by continuous extraction (72 hr.) with ether containing about 2·5 per cent. of alcohol and from 1 to 1·2 per cent. of water. The ether is evaporated under diminished pressure. After addition of 5 c.c. of N-butanol, the residue is made up to 25 c.c. with the last-named solvent. Aliquots of from 2 to 5 c.c. are treated, each with 2 c.c. of freshly distilled aniline, and made up to 25 c.c. for a turbidimetric comparison with like dilutions, made up without the aniline, at $\lambda=440$ mμ. The quantity of gossypol present was found to be accurately proportional to $\log \frac{I_0}{I_1}$, I_0 being the intensity transmission without aniline and I_1 the intensity transmission with the addition of the precipitant.

394. Cotton Seed Treatment Studies at the Blackland Experiment Station. By C. H. Rogers. (*Bull. No.* 634, Texas Agr. Exp. Sta., 1943.) The results are given

of seed-treatment studies with cotton at the Blackland Experiment Station, Temple, Texas, from 1938 to 1942 inclusive, with some data for 1932. Angular leafspot and soreshin were found to be serious seedling diseases of cotton under blackland conditions. Control of these diseases was attained in varying degrees by the seed treatments tested. In the six years the emergence of seedlings was increased by seed treatments in about 75 per cent. of the trials. In angular leafspot also the treatments were effective in almost all instances. The yield of seed cotton showed an increase in about 75 per cent. of the trials, a decrease in 15 per cent., and was not affected in about 10 per cent. Averages for certain tests showed that treatment of fuzzy cotton seed with 2 per cent. Ceresan or 5 per cent. New Improved, increased the stand of seedlings from 25 to 30 per cent. as compared with non-treated seed. Angular leafspot infection of Texas-grown seed was only about one-third to one-tenth as severe following these treatments. The yields of lint cotton were from 30 to 130 lb. per acre greater than in the non-treated seed plots. In some seasons acid-delinting gave results equally as good as mercurial dusts on fuzzy seed; the highest yields were frequently obtained by the use of delinted seed plus a fungicidal dust treatment. All of the chemicals except one (Spergonex) gave marked reduction in seedling infection and, except from machine delinting (reginning) in 1941, all methods of delinting gave good control of seedling infection. No particular fungicide was consistently superior to another. The most satisfactory materials were Ceresan (both 2 per cent. and New Improved 5 per cent.), Cuprocide, Cyanamid 154-6-B, and Spergon. Fungicidal dusts containing insoluble copper compounds appeared to be a promising treatment for cotton seed planted in alkaline blackland soil. Texas-grown seed was found usually to carry more angular leafspot infection than seed raised in the south-east. The extent of seedling infection with angular leafspot never exceeded 5·2 per cent. for south-eastern-grown seed, but amounted to as much as 92 per cent. with Texas-grown seed. Seed treatments were, therefore, most beneficial when locally grown seed was used. In the case of certain organic mercury dusts, it was found that the rate of application could be reduced one-half or more below the recommended amounts with about as good results in increasing emergence, in control of angular leafspot on the seedlings, and in improvement of seed cotton yield. No improvement in emergence of seedlings nor in seedling growth was obtained by supplementing the fungicidal dust treatment of the seed with indolebutyric acid. Separation of the seed according to specific gravity showed no consistent differences in stand or yield between the different fractions of light and heavy seed. No consistent differences were found between seed lots delinted by different chemical processes. Greater improvement in yield of seed cotton was derived from seed treatment when only two seeds were planted per hill as compared with 5 or 10 seeds per hill (all stands finally thinned to not more than 2 plants per hill, 18 inches apart). Thus the possibility of using less seed is indicated when properly treated seed is planted.

395. SPERGON (TETRACHLORO-*p*-BENZOQUINONE) COTTONSEED DISINFECTANT: TOXICITY. By T. H. McGavack *et al.* (*J. Ind. Hyg. and Toxicol.*, **25**, 1943, p. 98. From *Summ. Curr. Lit.*, xxiv., **14**, 1944, p. 329.) Spergon, which is used for the treatment of cottonseed, comprises 99 per cent. of tetrachloro-*p*-benzoquinone and 1 per cent. of Na_2H phosphate. An intensive study has been carried out with 385 rats, and skin tests have been performed on rabbits. When a sufficient dose was given Spergon caused loss of weight and strength, hæmoconcentration, preagonol azotæmia, leucopenia with a relative polymorphonucleocytosis, and an inconstant, late increase in the coagulability of the blood. " Carbol urine " was present when these drug effects were elicited. The drug, however, is only slightly toxic to healthy animals; it may comprise 0·5 per cent. of the diet for prolonged periods without effect. Animals in poor health may become more easily affected. Even so, there seems to be little danger of intoxication to either man or animal from this seed protectant. If all the agent were retained during handling and during its preparation for consumption by animals, concentrations would not rise above 0·2 per cent. Such a dose was found to be below the threshold of toxicity.

MACHINERY.

396. Cotton Plant Dusting Device. By C. W. McLaughlin. (U.S.P. 2,336,113. From *Summ. Curr. Lit.*, xxiv., **15**, 1944, p. 356.) The claim is for a unit duster that can be readily mounted on an agricultural vehicle for feeding (insecticidal) dust to a set of nozzles connected to a conduit that extends laterally from the main part of the apparatus. A motor-driven fan is mounted in this part to force the dust to the conduit through semicircular openings that can be closed by a slide valve.

397. Mechanical Cotton Picker. By A. W. Weems. (U.S.P. 2,333,965. From *Summ. Curr. Lit.*, xxiv., **11**, 1944, p. 245.) A cotton harvesting machine has a bank of picker spindles revolving in horizontal vertically spaced tiers, a bank of stripper fingers that pass through the spaces between adjacent tiers of picker spindles, and means to produce air currents and suction to remove the lint from the spindles.

398. Balls Sledge Cotton Sorter: Description and Application. By R. W. Vose. (*A.S.T.M. Standards on Text. Materials*, 1943, p. 415. From *Summ. Curr. Lit.*, xxiv, **9**, 1944, p. 201.) A brief description of the draw box and carriage of the Balls Sledge Sorter and their manipulation and use for plotting fibre length distributions. The accuracy of the instrument was checked by direct measurement of length on 25 fibres taken at each of a number of places on the plush spread. Except for one or two points the distribution of length of the 25 fibres was within the chosen limits, and the averages for the 10, 15, 20, 25, 30 and 35 mm. groups were, respectively, 9·7, 14·9, 19·4, 24·5, 29·2 and 33·0 mm. This calibration is better than some reported by Balls; the improvement is ascribed to a superior quality of plush and to small mechanical modifications in the instrument. As typical of the use of the sorter, a set of frequency curves is given for a sample of cotton in the bale (12 bales) and in the scutcher lap, draw-frame sliver, card sliver, card strips and roving.

399. Electro-pneumatic Opening Machinery: Advantages. By C. Consterdine. (*Text. Wkly.*, **33**, 1944, pp. 512, 552, 594. From *Summ. Curr. Lit.*, xxiv., **9**, 1944, p. 193.) A report of a lecture on the single-process system of cotton opening. Present difficulties in the production of good laps are ascribed to (1) high-density baling, (2) the wide range of cotton grades due to the extension of cotton growing to new areas, (3) the demand for the reduction of dust in mills, and (4) the demand for better laps for the better functioning of the carding engine. Modern developments in machinery to meet these demands, especially the adoption of electric controls and pneumatic mixing and conveying systems, are reviewed in some detail, and the following machines are mentioned: Hopper bale opener with electrically-controlled feeding lattice, Hopper feeder with creeper lattice and dust fan, Super-grid-area porcupine opener with feed lattice and Shirley cage and fan, Crighton opener cylinder fitted with by-pass valve, Hopper feeder with condenser and fan fitted with delivery regulator reserve box and wiper roller, Double opener consisting of one 24-inch cylinder and one pair of cages, one beater part with feed lattice, feed roller, cages and fan for down draught, and by-pass valve to miss the beater part if required, and electro-pneumatic automatic distributor with one inlet and two outlet valves to distribute cotton to two scutchers.

400. Cotton Drying Machine. By M. I. Teague. (U.S.P. 2,332,413. From *Summ. Curr. Lit.*, xxiv., **9**, 1944, p. 192.) The claim is for a machine in which a screen is arranged over the inner end of the air intake tunnel and a rotary brush works inside the screen to remove foreign matter.

401. Gin Saw Cleaner. By J. Delashaw and F. D. Gibson. (U.S.P. 2,332,783. From *Summ. Curr. Lit.*, xxiv., **10**, 1944, p. 220.) The device consists of a set of discs on a shaft so spaced that the separate plates of the gin saw will fit between them when the saw is mounted for cleaning. The discs carry cleaning blades mounted at reverse angles to the rims of the discs so that the inner ends of blades on adjacent discs cross and override the saw teeth as the cleaner is rotated.

402. Cotton Gin Cleaning System. By Junta Nacional del Algodon. (*Bol. Mens. No.* 95, Buenos Aires, 1943. From *Summ. Curr. Lit.*, xxiv., **7**, 1944, p. 148.)

Improved patented arrangements for cleaning cotton during the ginning process are described. Compressed air is directed on to the teeth of the saws charged with cotton in a direction opposite to their direction of rotation and impurities separated from the cotton are withdrawn pneumatically. Details of construction are shown in diagrams.

403. Shirley Analyser: Application. By G. W. Pfeiffenberger. (*Text. Res.*, **14**, 1944, p. 50. From *Summ. Curr. Lit.*, xxiv., **10**, 1944, p. 229.) The Shirley Analyser is briefly described. It is pointed out that there is a good correlation between Shirley Analyser waste percentages and combined scutcher and card waste so that rapid determinations can be made of the waste loss that may be expected in the mill. The relation between waste and grade is discussed and it is shown that an examination of waste may serve to explain some apparent discrepancies. "Grade" entails three factors—colour, leaf, and preparation. If two samples of cleaned lint are difficult to distinguish from each other, the difference in grade designation can be attributed to factors other than colour. If the cleaned samples differ in appearance, fibre deterioration as reflected by colour is indicated. Another useful application of the Shirley Analyser is for the analysis of mill waste products. A table is given showing percentages of clean lint recovered from samples of raw stock, finisher laps, finisher motes, card motes, flat strips, and cylinder and doffer strips. Average values are 97, 98, 45, 56, 89 and 96 per cent. respectively, indicating that a large part of the material now considered as waste is composed of good, usable fibre. This statement is substantiated by the results of fibrograph length tests on the reclaimed fibre. Fibrograph or array measurements used in conjunction with the Shirley Analyser would be useful for determining proper settings on scutchers, cards, combers, etc. The possibility of using the principle of the Shirley Analyser in the commercial cleaning of cotton either at the gin or in mill opening processes is discussed.

PESTS, DISEASES, AND INJURIES, AND THEIR CONTROL.

404. Recent Advances in Economic Entomology. (*J. Aust. Inst. Agr. Sci.*, **8**, 1942, p. 80. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 6.) In the course of an address by J. H. Smith to the Queensland branch of the Australian Institute of Agricultural Science the phenomena of morphological and physiological resistance of plants to insect attack were discussed, as well as the possibility of rendering the type of plant grown less attractive to pests through cultural practices without impairing the commercial merits of the crop. This possibility is actually being tested in a cotton growing project at Ayr, a region in which the spread of *Heliothis* is greatly favoured by climatic and other conditions. The high degree of immunity of some varieties of cotton to jassid attack was mentioned as being apparently linked in some way with the hairiness of the plant.

405. A Catalogue of Insecticides and Fungicides. By D. E. H. Frear. (*Sci.*, N.S., xcviii., **2557**, 1943, p. 585. From *Rev. App. Mycol.*, xxiii., **5**, 1944, p. 182.) The author has compiled a catalogue of approximately 5,000 individual insecticidal and fungicidal materials mentioned in over 500 literature citations as having been submitted to test for their insecticidal or fungicidal properties. Workers are invited to communicate any unpublished data, reprints, or citations dealing with insecticidal or fungicidal tests. In particular, lists of materials tested by industrial research laboratories would be welcomed, even if the results obtained were negative. It is intended to issue the catalogue as soon as possible, and every *bona fide* contributor is assured of a copy.

406. Labor Realizada por la Estación Experimental Algodonera de la Banda, en el Año, 1942. (*Bol. Junta nac. Algodon*, 99-100, Buenos Aires, 1943, p. 371. From *Rev. App. Ent.*, xxxii., Ser. A, **4**, 1944, p. 106.) This report contains a brief section on the pests observed in experimental cotton fields at La Banda, Argentina, in 1942. They include *Epitragus mucidus*, Berg., *Agrotis ypsilon*, Hfn., *Aphis gossypii*, Glov., *Platyedra gossypiella*, Saund., *Thyreion gelotopœon*, Dyar,

Tetranychus telarius, L., *Chalcodermus niger*, Hust., and *Alabama argillacea*, Hb., but the only one that caused serious injury was *Gargaphia torresi*, Costa Lima, against which dusts and sprays of nicotine sulphate were ineffective.

407. Georgia: Cotton Pests, 1941-42. By T. L. Bissell. (*54th Rpt. Ga. Exp. Sta.*, 1941-42. From *Rev. App. Ent.*, xxxii., Ser. A, **6**, 1944, p. 190.) Work on cotton pests included observations of *Systena blanda*, Melsh. There was a further outbreak of this flea-beetle in 1942, though rainfall had been almost normal during the preceding winter. Its distribution was somewhat greater than in 1941, but damage appeared to be lighter.

408. Entomologia Agricola del Peru. By J. E. Wille. (Estacion Exp. Agr. de la Molina, Peru, 1943. $5 U.S. Reviewed *Trop. Agr.*, April, 1944, p. 63.) This is a practical book on the agricultural entomology of Peru, written for entomologists, agriculturists and students of agriculture. A preface outlines the history of economic entomology in Peru, and an introductory chapter discusses the importance of insects and the climatic and ecological conditions which influence outbreaks of pests in that country. There are chapters on the insects attacking the following crops: cotton, sugar-cane, rice, wheat, maize, coffee, cacao, tea, tobacco, citrus, olives and other fruits, vegetables, and other cultivated plants. There is a chapter on the insects which attack stored produce and one on the various methods of insect pest control. The book concludes with a bibliography, a glossary and an index. Dr. Wille is to be congratulated on his book, which will undoubtedly be of use in Peru, and brings the pest control problems in agriculture in this part of South America to the notice of entomologists in other parts of the world.

409. Relation of Fertilizers to the Development of the Cotton Aphid in 1941 and 1942. By R. L. McGarr. (*J. Econ. Ent.*, **36**, 4, 1943, p. 640. From *Rev. App. Ent.*, xxxii., Ser. A, **4**, 1944, p. 132.) Investigations on the effect of treating land planted to cotton with nitrogenous fertilizers on the development of *Aphis gossypii*, Glov., carried out in Mississippi in 1941 were repeated in the same locality in 1942 with similar results. Fertilizers containing fairly constant amounts of phosphoric acid and potash, alone or with different amounts of nitrogen, were applied at the same rate and time as before, and six applications of 6·3 to 6·9 lb. calcium arsenate per acre were made at 5-day intervals from July 10, when the first flowers appeared on the cotton. The increase in the number of aphids was significant on all plants dusted with calcium arsenate, and the use of nitrogenous fertilizer resulted in a definite increase in population, correlated with the percentage of nitrogen in the fertilizer, when calcium arsenate was used, but caused no appreciable difference when it was not. Infestation by the boll weevil was negligible in all plots.

410. Cotton Aphid Damage and Control in Texas. By K. P. Ewing. (*J. Econ. Ent.*, **36**, 4, 1943, p. 598. From *Rev. App. Ent.*, xxxii., Ser. A, **4**, 1944, p. 124.) An account of experiments carried out in Texas in 1942 on the control of *Aphis gossypii*, Glov., and the reduction it causes in the yield of cotton. The materials tested were calcium arsenate, basic copper arsenate, synthetic cryolite and nicotine from nicotine sulphate; 5 per cent. hydrated lime was added to the calcium arsenate and cryolite when nicotine sulphate was used, to provide sufficient free lime to liberate the nicotine. All applications, with the exception of one series, were made early in the morning. All the dusts controlled injurious infestations of the boll weevil and the bollworm, *Heliothis armigera*, Hb., and differences in yields were due chiefly to aphid infestation. The yields of seed cotton on untreated plots in the three experiments were 977, 842 and 705 lb. per acre. In the first experiment, in which the plots were dusted eight times between July 10 and August 13, only cryolite alone and cryolite and calcium arsenate with 1 per cent. nicotine gave significant increases in yield (219, 234 and 222 lb. seed cotton per acre); plots treated with calcium arsenate alone or with sulphur (1 : 2) and 0·5 per cent. nicotine had significantly higher populations of aphids and yielded slightly less than the control plot. In the second, in which applications were made on the same dates, alternate applications of calcium arsenate alone and with 2 per cent. nicotine resulted in

significantly lower aphid infestation than calcium arsenate alone or with 0·5 per cent. nicotine, or than calcium arsenate with 1 per cent. nicotine applied at midday, and increased the yield by 264 lb. per acre, as compared with 134, 83 and 84 lb.; calcium arsenate with 1 per cent. nicotine applied in the early morning resulted in a gain of 194 lb. In the third experiment, seven applications were made between July 11 and August 12. Calcium arsenate with 0·5 per cent. nicotine permitted considerable increase of the aphid, which caused premature shedding of about 50 to 75 per cent. of the leaves; calcium arsenate with 1 per cent. nicotine permitted little increase until late in the season, when migration occurred from the plot treated with calcium arsenate and 0·5 per cent. nicotine, and there was some damage and leaf drop. Aphids increased somewhat and produced honeydew on the lower leaves of plants dusted with basic copper arsenate and sulphur (1 : 2), but no noticeable injury was caused. Yield records showed gains of 64, 232 and 523 lb. per acre, respectively, from the three treatments. Basic copper arsenate was as effective as calcium arsenate against *Heliothis* and *Anthonomus*, and it is possible that part of the increase in yield on plots treated with it may have been due to increased residual control of these pests late in the season.

411. Hibernation of the Boll Weevil. By H. J. Reinhard. (*Bull.* 638, Texas Agr. Exp. Sta., 1943.) During the fall boll weevils instinctively seek sheltered situations in which to pass the winter, but the insects do not enter a period of true hibernation. They remain more or less active during warm spells in winter and may emerge from shelter until forced to reseek protection by the recurrence of lower temperatures. The average duration of the so-called weevil hibernation period, as determined by local cage studies, extends from November to May.

412. Calcium Arsenate With and Without Cubé and Nicotine for Control of the Boll Weevil and the Cotton Aphid at Tallulah, La., in 1942. By M. T. Young *et al.* (*J. Econ. Ent.*, **36**, 6, 1943, p. 901. From *Exp. Sta. Rec.*, **90**, 6, 1944, p. 803.) Calcium arsenate treatments for boll weevil control are usually followed by an increase in cotton aphid populations, which may greatly reduce the yield and in certain cases lower the grade of the cotton. From the two experiments here reported upon, in both of which the boll weevil infestation was light, it was indicated that poisoning with calcium arsenate may result in reduced yields unless an aphicide is also used. Comparisons are made of the arsenate alone and alternating and in combination with aphicides, as well as of the effects of applying at different times of the day.

413. Dosages of Insecticides to Control the Boll Weevil and the Bollworm. By K. P. Ewing and C. R. Parencia, jr. (*J. Econ. Ent.*, **36**, 4, 1943, p. 607. From *Rev. App. Ent.*, xxxii., Ser. A, **4**, 1944, p. 125.) Field-plot experiments were carried out in Texas in 1942 to determine whether reduced dosages of calcium arsenate would give effective control of *Anthonomus grandis*, Boh., and whether it could be replaced by cryolite, and to compare the control of *Heliothis armigera*, Hb., given by calcium arsenate, cryolite, lead arsenate and basic copper arsenate at approximately 8 lb. per acre, and by increased dosages of calcium arsenate and decreased dosages of basic copper arsenate. The calcium arsenate, lead arsenate and basic copper arsenate used contained 40·4–42·4, 32·8 and 38·7 per cent. total arsenic pentoxide and 3·5–11·1, 0·47 and 0·1 per cent. water-soluble arsenic pentoxide, respectively; the synthetic cryolite contained 85·1–87·4 per cent. sodium fluoaluminate, and the sulphur was 84·6–96 per cent. pure. In the two experiments against *A. grandis*, infestation by it was too light to show marked differences in yield between plots treated with calcium arsenate, cryolite and various mixtures of these with sulphur, but in the second experiment, calcium arsenate and sulphur (1 : 1, 1 : 3, and 1 : 7) reduced the percentages of squares punctured to 11·7, 11·9, and 12 as compared with 13·3, 15·6, and 12·8 for similar mixtures of cryolite and sulphur and 20·9 in the controls. In this experiment, *H. armigera* was injurious and was more effectively controlled by cryolite than by calcium arsenate. The increases in yield over the control (844 lb. seed cotton per acre) averaged 159 lb. for the three cryolite dusts and 55 lb. for the three mixtures of calcium arsenate. In the two

experiments on the control of *H. armigera*, boll weevil, fleahoppers (*Psallus seriatus*, Reut.) and aphids (*Aphis gossypii*, Glov.) caused no appreciable damage. In one, calcium arsenate at the rate of 8·2, 12·4, and 15·8 lb. per acre resulted in increases in yield of 225, 275, and 397 lb. per acre over the control (835 lb.), and basic copper arsenate and sulphur (1 : 1 and 1 : 2) at 16 lb. mixed dust per acre in increases of 371 and 273 lb. In the other the increases in yield over the control (592 lb. per acre) due to applications of approximately 8 lb. per acre of basic copper arsenate (diluted with an equal amount of sulphur), lead arsenate or cryolite (462, 446 and 442 lb.) were significantly higher than that due to similar applications of calcium arsenate (252 lb.).

414. Some Factors Influencing Bollworm Populations and Damage. By K. P. Ewing and E. E. Ivy. (*J. Econ. Ent.*, **36**, 4, 1943, p. 602. From *Rev. App. Ent.*, xxxii., Ser. A, **4**, 1944, p. 125.) Observations made in Texas since 1928 have shown that although infestations of *Heliothis armigera*, Hb., on cotton can be controlled by timely heavy applications of calcium arsenate, they may become greater on plants that receive applications that are ill-timed or too light than on undusted ones. The increase is frequently associated with increased populations of cotton aphids, and may be due partly to the attraction of the moths to honeydew for food. In cage tests, several Coccinellid predators of the bollworm and the aphid were killed by arsenicals, and the daily consumption of bollworm eggs was considerably reduced in the case of *Orius insidiosus*, Say, *Hippodamia convergens*, Guer., and *Collops balteatus*, Lec., and somewhat reduced in the case of *Scymnus creperus*, Muls., and *Chrysopa* sp. when aphids were present as alternative food. Although a normal hatch of eggs occurred in cages containing *Zelus renardi*, Kol., none of the larvæ reached the second instar when this predator was present.

415. Contribución al Conocimiento de la *Chinche tintorea*, *Dysdercus* sp. (*Hemiptera Pyrrhocoridæ*) con Notas Sobre su Biologia. By A. Freibert. (*Bol. Junta nac. Algodon* 99-100. Buenos Aires, 1943, p. 360. From *Rev. App. Ent.*, xxxii., Ser. A, **4**, 1944, p. 106.) The author describes the injury caused to cotton by *Dysdercus* and states that five species of this genus have been recorded from Argentina, though little is known of their economic importance. They include *D. ruficollis*, L., with which the others have sometimes been confused. Descriptions are given of all stages of an unidentified species of *Dysdercus* that was collected in Salta, Santiago del Estero, Chaco, Formosa, northern Santa Fé, and Corrientes, together with an account of laboratory investigations on its bionomics. At an average temperature of 29·2° C. (84·56° F.), the egg stage and total development lasted 4 and 25-41 days, respectively, the corresponding figures at an average of 10·4° C. (50·72° F.) being 12 and 65-135. The adults paired several times, and the females deposited an average of 503 eggs, with a maximum of 833, in about 10 batches, beginning 7-12 days after emergence. The intervals between the batches were usually 1-8 days, but ranged up to 17. The first batches deposited contained more eggs than the later ones. Chromatic variations in the adults were common, and the size of the latter varied with the food-plant. The species was taken on cotton, *Chorisia* sp., and wild Malvaceæ.

416. Locusts in Nyasaland. By C. Smee. (*Nyasaland Agr. Qrtrly.*, **4**, 1, 1944.) No swarms of *Nomadacris septemfasciata* were reported in Nyasaland from October, 1943, to January, 1944, but fair numbers of solitary or semi-solitary locusts were observed in tree-less areas with short grass. These may either be stragglers from passing swarms, or indicate the return of the locusts to the solitary phase. Although it seems unlikely that hopper bands of any magnitude can develop from eggs laid by isolated locusts, incipient concentrations may be formed.

417. Bibliography on Insect Pest Resistance in Plants (with a Supplement on Resistance to Nematodes). See Abstract 446.

418. Effect of Different Foods on the Larval and Post-Larval Development of the Moth *Prodenia litura*, Fb. (Lepidoptera, Noctuidæ). By A. C. Basu. (*J. Bombay Nat. Hist. Soc.*, **44**, 2, 1943. From *Rev. App. Ent.*, xxxii., Ser. A, **7**, 1944, p. 248.) An account of laboratory experiments carried out in

Calcutta to find additional food-plants of *Prodenia litura*, F., and to determine the effect of variations in food on development. Lists of food-plants are given from the literature, with an additional 20 plants on which the larvæ developed in these experiments, and the effect of green fruits of banana and papaya and leaves of cabbage, cauliflower, cotton, lettuce, mulberry, and spinach on the size of the larva, pupa and adult and on the length of the larval and pupal stages, when the insects were reared at approximately 19-22° C. (66·2-71·6° F.) and at 30° C. (86° F.), are shown in tables and discussed in detail. Cauliflower, mulberry, lettuce and spinach resulted in short larval and pupal periods and large insects, cotton leaves caused long developmental periods and small insects, and banana, cabbage and papaya were intermediate in effect. All three stages were larger and development took longer at the lower temperatures than at the higher ones.

419. Cotton Stem Weevil: Distribution and Seasonal History in South India. By P. N. K. Ayyar. (*Ind. J. Agr. Sci.*, **13**, 1943, p. 255. From *Summ. Curr. Lit.*, xxiv., **7**, 1944, p. 148.) A report on a survey of the distribution of the cotton stem weevil, *Pempherulus affinis*, Fst., in four ecologically distinct tracts of South India. The probable factors affecting incidence are discussed. Evidence is accumulating that the weevil is indigenous in origin and that its original and natural food plant is probably not cotton. Its occurrence on other food plants in most districts is a source of potential danger to the spread of cotton cultivation. Data collected in a systematic examination of cotton plants in two fields during the period November 1939 to August 1940, and in the examination of various alternative food plants, are tabulated and discussed. Observations of parasites of the stem weevil and their seasonal incidence are reported.

420. Effectiveness of Wood Preservatives in Preventing Attack by Termites. By T. E. Snyder and J. Zetek. (*U.S. Dpt. Agr. Circ.* 683, 1943. From *Exp. Sta. Rec.*, **90**, 4, 1944, p. 509.) Three general classes of wood preservatives used against termites include (1) preservative oils such as creosotes, (2) water-soluble salts such as zinc chloride, and (3) toxic chemicals dissolved in light petroleum oils. Uniform, well-distributed, and good penetration into the wood is essential for effective preservative impregnations.

421. A Preliminary Study on the Distribution and Habits of South Florida Termites. By E. M. and D. B. Miller. (*Fla. Acad. Sci. Proc.*, **6**, 3-4, 1943, p. 101. From *Exp. Sta. Rec.*, **90**, 6, 1944, p. 812.) A progress report on a single phase of studies on the ecology of the termites of the State, to be followed by other reports and a final summarizing paper. All of the thirteen known Florida species are represented in the southern part of the State. Collections made in recent years by A. E. Emerson and the authors have added new information, noted herein, and have furnished the data necessary for constructing a practical key for identifying the species found in Florida.

422. A Key to the Termites of Florida. By A. E. Emerson and E. M. Miller. (*Fla. Acad. Sci. Proc.*, **6**, 3-4, 1943, p. 108. From *Exp. Sta. Rec.*, **90**, 6, 1944, p. 812.) See preceding abstract.

423. Termite Protozoa: Digestion of Cellulose. By R. E. Hungate. (*Ann. Entomol. Soc. America*, **36**, 1943, p. 730. From *Summ. Curr. Lit.*, xxiv., **10**, 1944, p. 235.) Cellulose-digesting protozoa (the hypermastigote flagellates *Trichonympha collaris*, *T. campanula*, *T. sphærica* and the polymastigote flagellate *Trichonomas termopsidis*) were removed from the alimentary tracts of termites (*Zoötermopsis nevadensis*, *Z. angusticollis*), suspended in an inorganic salt solution and allowed to act on powdered cellulose for periods up to 108 hours at 25·5°. The digestion products, which were recovered to 70-75 per cent. of the initial cellulose, consisted of carbon dioxide, hydrogen, and acids, principally acetic acid (85 per cent. of total acid). No glucose was demonstrated as a product of cellulose digestion by the protozoa. Apparently, the principal carbonaceous materials used by *Zoötermopsis* are fermentation products produced by protozoa from the glucose which they obtain by cellulose digestion. Gas and acid (acetic acid, etc.) were identified as products of cellulose digestion by protozoa taken from the digestive tracts of another termite

(*Reticulitermes claripennis*). Probably an anaerobic fermentation process is characteristic of most of the wood-digesting protozoa found in termites. Tests showed that acetic acid and probably also the non-volatile acids produced by the protozoa are absorbed from the mid-intestine of the termites. These acids are oxidized by the termites to obtain energy; carbon, carbon dioxide, and hydrogen are eliminated.

424. THE LIFE-HISTORY OF A TSETSE FLY. By R. W. Jack. (*Rhod. Agr. J.*, Jan.-Feb., 1944, p. 25.) The author has brought together the results of the research work of various investigators in such a form as to present a picture of the life of a tsetse fly, in this case mainly the species *Glossina morsitans*, the species most studied in Southern Rhodesia. The subject is discussed under the following headings: Some physiological facts; Environment; Behaviour; Reaction to environment. It is stated in conclusion that tsetse flies, particularly those species such as *morsitans*, which inhabit dry open forest and feed habitually on game, are very delicately poised in the balance of Nature, due to their peculiar physiological limitations, their habits, and their slow rate of reproduction. They get along very well so long as nothing interferes with the complex of conditions to which they are adapted, but if any important change occurs, through human agency or otherwise, such as serious depletion of numbers of game or modification of the habits of animals, experience has shown that the flies fail to maintain themselves and gradually die out.

425. THE PARASITE CATALOGUE OF THE IMPERIAL PARASITE SERVICE. (From a review in *Scientific Agriculture*, Canada.) The rapid development of scientific and practical work on parasitic and predaceous insects during recent years has created a need for a work of reference indicating the host relations of the entomophagous species and providing in a convenient form a bibliography of the subject. To meet this need the Parasite Catalogue of the Imperial Parasite Service is being published. The first instalment of the Catalogue (now in course of publication) comprises rearing records for parasites and predators published during the years 1912 to 1935 inclusive, and is estimated to contain about 100,000 citations, the bulk of the records being taken from the *Review of Applied Entomology* and papers mentioned therein. The Catalogue is divided into four sections:

Section I. Parasite Host Catalogue.—Part 1. Arachnida and Coleoptera; 2. Dermaptera and Diptera; 3. Hemiptera; 4. Hymenoptera, Isopoda and Isoptera; 5. Lepidoptera A-C; 6. D-G; 7. H-M; 8. N-P; 9. Q-Z; 10. Orthoptera, Psocoptera and Thysanoptera.

Section II. Parasite Catalogue.—To be issued in parts of convenient size.

Section III. Predator Host Catalogue.—Part 1. Arachnida, Coleoptera, Collembola and Diptera; 2. Hemiptera; 3. Hymenoptera, Isoptera, Lepidoptera, Mollusca, Myriapoda, Neuroptera, Orthoptera, and Thysanoptera.

Section IV. Predator Catalogue.—To be issued in parts of convenient size.

In the Parasite Host and Predator Host Catalogues the names of parasites are grouped under the names of their host insects, assembled in Orders. In the Parasite and Predator Catalogues host insects are grouped under the names of their parasites and predators, assembled in Orders. In all the parts of the Catalogue synonyms are connected by cross-references so that hosts, parasites or predators may be found under any name used to designate them in any publication cited.

For the sake of economy the Catalogue has been printed by the Multigraph method on stout bond paper. The volumes are approximately Crown 4to. Each part is bound separately in cloth-covered boards. The price of the parts is fixed at present at $2.00 (Canadian) each, and will be maintained at as low a level as basic costs permit. Part 1, listing about 1,000 species of Arachnida and Coleoptera and about 1,300 species of parasites, and Part 2, listing about 600 species of Dermaptera and Diptera, are ready; the remaining parts will follow at short intervals. Obtainable from The Imperial Parasite Service, Imperial Institute of Entomology, 228, Dundas Street, Belleville, Ontario, Canada, and also (at 10s. per part) from The Imperial Agricultural Bureaux, Aberystwyth, Wales.

426. RIPENING AND FERTILITY OF FEMALES OF *Habrobracon brevicornis*, WESM., AS DEPENDENT ON DEVELOPMENT CONDITIONS DURING PRE-IMAGINAL PHASES. By

I. S. Skoblo. (*C.R. Acad. Sci. U.S.S.R.*, **33**, 6, Moscow, 1941. From *Rev. App. Ent.*, xxxii., Ser. A, **7**, 1944, p. 226.) The temperature in Azerbaijan is high from April onwards, but *Bracon* (*Habrobracon*) *brevicornis*, Wesm., which parasitizes the larvæ of the cotton moth (*Heliothis armigera*, Hb.), does not become active until June or July. It increases considerably in numbers towards the end of August, when it may parasitize 40 to 80 per cent. of the larvæ, but becomes less abundant in September and disappears by the end of the month, although temperatures are still fairly high. *Heliothis* larvæ are abundant until late October or November, and in laboratory investigations on its bionomics oviposition was found to continue until the temperature was as low as 10-11° C. (50-51·8° F.). During observations in the autumn of 1939 it was noticed that females that had developed at 17-19° C. (62·6-66·2° F.) did not puncture the host larvæ or oviposit for months, whereas those that had developed at 25-30° C. (77-86° F.) sometimes oviposited 1 to 3 days after emergence. More detailed investigations were accordingly made in October and November of the same year. Females that were reared and kept as adults at 30° C. began to oviposit on the day of emergence, and others that were reared at the same temperature and kept at 23-26° C. (73·4-78·8° F.), 17-19° C. and 14-16° C. (57·2-60·8° F.) had average pre-oviposition periods of 1·8, 2·6, and 8 days, respectively. Females reared at 17-19° C. and kept at 23-26° C. were ready to oviposit in 2 to 33 days, but those reared and kept at 17-19° C. had an average pre-oviposition period of 102 days. In further experiments, the pre-oviposition periods were normal if the females were kept at 23-26° C. during the egg and larval stages and at 17-19° C. during the prepupal, pupal and adult stages, or if they were kept at the lower temperature till the end of the larval stage and then at the higher one, but were prolonged if they were transferred to the lower temperature in the course of the larval stage and subsequently kept at that temperature. The length of pre-oviposition period was found to reduce the fecundity of the females. Those with pre-oviposition periods of 1-5, 6-10 and 11 or more days at 23-26° C. deposited averages of 284·5, 146·3, and 114·4 eggs, respectively, the decrease in the total number of eggs being due chiefly to a reduction in the average number per day. The three females with the longest pre-oviposition periods (20, 30, and 33 days), however, deposited 240, 262, and 342 eggs. Of females kept at 17-19° C., those with pre-oviposition periods of 4-11 and 50-131 days deposited averages of 308 and 76 eggs. The mean temperatures in the Kirovabad district during the first and second 10 days of September are 18·9° C. (66·02° F.) and 17·1° C. (62·78° F.), respectively. Parasites that develop at this season are therefore likely to undergo a long pre-oviposition period and hibernate; experiments have shown that females that have begun to oviposit are less resistant than those that have not. If the fecundity of the over-wintered females in the field in spring is as low as that observed in slowly maturing females under experimental conditions, it would explain the scarcity of the parasite at that season. The investigations also indicate that the release against *H. armigera* of parasites reared at 25° to 30° C. might be effective in early summer or in autumn, when they would reduce subsequent infestation of the current cotton crop or that of the following year.

427. Preliminary Trials with *Trichogramma* Parasites for the Control of the Cotton Bollworms. By M. C. Cherian and V. Margabandhu. (*Madras Agr. J.*, **31**, 4, 1943. From *Rep. App. Ent.*, xxxii., Ser. A, **7**, 1944, p. 230.) A species of *Trichogramma* that the authors tentatively regard as *T. minutum*, Ril., though they consider the latter doubtfully distinct from *T. evanescens*, Wesm., has been found in India as a parasite of *Earias* spp. on cotton, *Proceras* (*Argyria*) *sticticraspis*, Hmps., and *P.* (*Diatræa*) *venosatus*, Wlk., on sugarcane and *Schœnobius bipunctifer*, Wlk. (*incertellus*, Wlk.), on rice, and has been liberated for the control of *P. sticticraspis* in Mysore. In 1941-42, the effect was tested of releasing this species against *Earias fabia*, Stoll., and *Platyedra gossypiella*, Saund., on cotton at Coimbatore. In preliminary laboratory trials with eggs of *E. fabia* a high percentage of parasitism, ranging from 59 to 100, was obtained, irrespective of whether the eggs were 1, 2 or

3 days old. The number of parasites that emerged from each of 13 host eggs was either 1 or 2, and the duration of the life-cycle ranged from 6 to 9 days, with an average of 8. Emergence from the host eggs was almost complete in 2 days. The total number of eggs laid by a female that survived for 11 days was 125, with a maximum of 20 in a day, estimated from the adults that emerged, whereas another female, which only lived for 8 days, laid a maximum of 53 eggs in 1 day. In tests with eggs of *Platyedra gossypiella*, the percentage parasitism varied from 20 to 96, only 1 parasite emerged from each host egg, and the life-cycle was completed in about a week. For release in the field, *T. minutum* was bred in the laboratory in eggs of *Corcyra cephalonica*, Staint., and 18 liberations were made between December 17, 1941, and the end of February, 1942, in four cotton fields, the parasites being released in the centres of ½-acre plots covering each field, at the rate of 5,000 per plot every 4 days. Subsequent fortnightly examination of over 80,000 burst bolls from treated and untreated fields showed that the percentage infestation in both fell until February and then rose again, but the minimum was considerably lower in the treated fields than in the others.

428. Enemigos y Enfermedades del Algodonero (Pests and Diseases of Cotton). By A. de W. Bertoni. (*Agr. Com. Industr. Asuncion*, i., **4**, 1941, p. 57. From *Rev. App. Mycol.*, xxiii., **5**, 1944, p. 176.) The most serious disease of cotton in Uruguay is anthracnose (*Glomerella gossypii*), where other pathogens of the crop include *Bacterium malvacearum*, wilt (*Fusarium vasinfectum*) and the leafspots caused by *Cercospora gossypina* and *Ramularia areola*.

429. Technique for Testing Resistance of Cotton Seedlings to the Angular Leafspot Bacterium. By R. Weindling. See Abstract 457.

430. The Genetics of Blackarm Resistance. IV. *Gossypium punctatum* (Sch. and Thon.) Crosses. By R. L. Knight. See Abstract 445.

431. Cotton Bacterium: Characteristics. By B. H. Caminita *et al.* (*Publ. Health Rep., Washington*, 58, 1943, p. 1165. From *Summ. Curr. Lit.*, xxiv., **7**, 1944, p. 167.) An illness caused by inhaling cotton dust has been attributed to the endotoxin of the "cotton bacterium." The present paper describes the characters of 107 strains of this organism. It is a capsulated motile Gram-negative bacillus forming mucoid, often yellowish, colonies. Failure to form indole, negative methyl red reaction, positive Vosges-Proskauer and growth in sodium citrate identify it as an *Aerobacter*, and gelatin liquefaction and incomplete fermentation of glycerol further identify it as *A. cloacæ*. By the study of many other characters the 107 strains were separated into three types, with a fourth miscellaneous group; that designated Type 1 predominated, and it is this type which has been shown in various ways to possess the endotoxin to which mill fever is attributed. Serological studies showed the group to be antigenically heterogeneous. Information is also given about pathogenicity for animals, viability under natural conditions, and the effects of inoculating cotton plants.

432. Mildew in Cotton. I. The Routine Examination of Textile Antiseptics. II. Estimation of Salicylanilide in Textiles. III. Synthetical Experiments in Antiseptics for Textiles. Derivatives of Cashew-Nut Shell Oil. By R. C. Gandhi and K. Venkataraman. See Abstract 482.

433. Studies on the Root-Rot Disease of Cotton in the Punjab. XII. Control by Varying Sowing Date. By R. S. Vasudeva. (*Ind. J. Agr. Sci.*, October, 1943, p. 515.) An account of experimental work carried out over five years to effect control of the root-rot disease of cotton by varying the sowing date in the Punjab. The major portion of the work was conducted at Lyallpur and Khanewal under heavy and uniform conditions of infection in order to obtain reliable and comparable data. In addition some experiments were also carried out at Sargodha. The results indicated that late sowings of cotton towards the end of June and early sowings in the first week of April escape severe attacks of the disease. May sowings are most severely attacked. From infected fields a remunerative yield of seed cotton is obtained by sowing the crop about the end of June and by close planting.

A reasonable outturn is also obtained from infected fields by sowing *desi* cotton (*G. arboreum* var. *neglectum* f. *bengalensis*) very early in April.

[*Cf.* Abstr. 461, Vol. XIX. of this Review.]

434. ROOT ROTS OF CERTAIN NON-CEREAL CROPS. By G. H. Berkeley. (*Bot. Rev.*, **10**, 2, 1944, p. 67. From *Rev. App. Mycol.*, xxiii., **7**, 1944, p. 269.) After a brief introduction the author reviews the literature on the root rots of woody perennials, tobacco, cotton, sugar beet, sugarcane, maize, flax, soybean, vegetables, herbaceous ornamentals, etc., and then discusses the relation of temperature, soil reaction, and humidity to that group of diseases, and their control by means of resistant varieties, crop rotation, biological agents, fertilization, soil disinfection, organic manures, ringing, felling, and barriers. Concluding sections are devoted to types of root rot and trends in research. A bibliography of 347 titles is appended.

435. STUDIES IN THE PERIODIC PARTIAL FAILURES OF THE PUNJAB-AMERICAN COTTONS IN THE PUNJAB. VIII. THE RELATION OF WEATHER FACTORS WITH THE SPREAD OF *Tirak* IN AMERICAN COTTONS. By R. H. Dastur and U. C. Tashna. See Abstract 301.

436. PLANT VIRUSES AND VIRUS DISEASES. By F. C. Bawden. (2nd revised edn. The Chronica Botanico Co., Waltham, Mass.; Wm. Dawson and Sons, Ltd., London, W.1, 1943, $4.75 U.S. *Trop. Agr.*, May, 1944, p. 83.) The revised edition of this book provides an up-to-date summary of the literature on plant viruses. The author has not attempted to give detailed descriptions of the symptoms produced by individual viruses, or their host ranges, but has discussed the subject as a whole, the text being supplemented by many excellent illustrations. Due to the rapid progress made in certain aspects of the subject since the appearance of the original edition, all the chapters have been modified to a greater or lesser extent. The writer gives a full account of the internal and external changes induced in the host plant by certain viruses, and a discussion of transmission is followed by a consideration of the relationship between the viruses and their insect vectors. The alteration of some viruses in a manner suggestive of a genetical mutation, resulting in the production of numerous strains, is described together with the acquired immunity found in some cases. Of particular interest is the account of the purification of certain virus nucleoproteins and their chemical, physical and serological properties, a subject to which the author has made a noteworthy contribution. In view of their increasing importance to tropical workers, and the special problems their study presents, it is unfortunate that the writer has devoted comparatively little attention to the viruses attacking tree crops. A chapter is devoted to the metabolism of infected plants and the movement of viruses within the host. The author outlines the properties which he considers should be made the basis of virus classification, but has wisely refrained from evolving any additional system of nomenclature. Notes are given on control measures, and the book ends with an interesting discussion of the theories regarding the origin and multiplication of viruses. The book should prove of value to all those interested in plant viruses.

[*Cf.* Abstr. 511, Vol. XVII. of this Review.]

437. PLANT VIRUS DISEASES AND THEIR CONTROL: TRANSACTIONS OF THE CONFERENCE ON PLANT VIRUS DISEASES, MOSCOW, 4/7/11, 1940. (Moscow-Leningrad Acad. Sci. U.S.S.R., 1941. Received 1944. From *Rev. App. Mycol.*, xxiii., **6**, 1944, p. 210.) S. N. Moskovets (pp. 173-190) considers that the virus disease of cotton in Azerbaijan is not identical with leaf curl occurring in the Sudan. Local symptoms do not include the protruding nervature or the cup-like outgrowths on the lower side of leaves characteristic of the Sudan disease; the sap of healthy plants is pink and that of diseased ones light brown as against reddish-blue and bright green, respectively, in the Sudan; the vectors are different in the two countries, and so are varieties showing resistance to the disease. To avoid confusion of the two diseases it is proposed to name that in Azerbaijan "cotton curliness." The disease is stated to have been steadily increasing since its discovery in 1934. In one test the disease caused a reduction of 55 per cent. in the number of bolls formed; in another a reduction of 72·9 per cent. was caused when infection occurred early in the season,

the percentage gradually falling to 35·5 with progressively later dates of infection. The number of bolls formed on plants with severe, medium, and slight infection was by 60, 30·7 and 12 per cent., respectively, smaller than that on a healthy one. The susceptibility to cotton curliness varied from variety to variety, the average reduc'ion in yield ranging from 16·2 to 55·6 per cent., and within a variety from one locality to another. It is estimated that in years with severe infection susceptible varieties may suffer losses in yield up to 9·5 per cent. The disease also affects the quality of the cotton fibre, reducing its length by about 7·5 per cent. and lessening its absolute strength by from 3·3 to 16·6 per cent. for different varieties. The average absolute weight of seeds from diseased plants was 11·2 per cent. lower than that from healthy ones. The virus from cotton was successfully transmitted by *Aphis gossypii*, or by infusing infected sap into decapitated stems of healthy plants, to *Gossypium barbadense* and its variety *maritima*, and to *G. hirsutum*; similar symptoms were produced on *Hibiscus cannabinus* and *Solanum dulcamara*. Three years' experimental data showed that under local conditions *A. gossypii* is the most important vector (85 to 100 per cent. successful transmissions), *A. laburni* (6·1 to 16·6 per cent.), *Myzus persicæ* (12·5 to 25 per cent.), and *Epitetranychus althææ* (7·7 to 10 per cent.) playing a secondary part. The incubation period of the virus varied from 35 to 56 days. In field tests conducted for 4 years and under experimental conditions with isolation from insects, evidence pointed to the possibility of seed transmission. When cotton was sown in strips of 3, 4, or 5 rows each, with a distance of 140 cm. between the strips, the infection percentages were 3·2, 2·9 and 2·7 respectively, substantiating the previous conclusion that less disease occurs in denser stands. The average percentages of infection were 15·5, 19·8, 54·8 and 88·8 following sowings in April, May, June, and July, respectively, the higher incidence in the summer-sown plants being at least partly due to higher temperatures of soil and air. Some cotton varieties were resistant to the virus; the most promising among those bred in Azerbaijan were strains of *G. barbadense*, such as Giza 7 and 3782-1 (from Giza 12), and of *G. maritima*, such as Nos. 1, 2, and 7, and among those bred in Russian Central Asia, 6081, No. 15, 263, 4623a, and 35-1. For the control of cotton curliness the author suggests the growing of resistant strains, roguing of infected plants, separate harvesting from healthy and diseased plants to ensure healthy seed for the next year, and control of vectors.

V. L. Ryjkoff and Mme. T. P. Ovcharova (pp. 191-196) describe the anatomical changes produced by the virus disease of cotton found in Azerbaijan. They consist in a thickening of the leaf lamina, the presence of excessive starch in the lamina and petioles, under-developed bast fibres in the petioles, and under-developed roots, which are poor in starch. The disease is considered to be a special type of yellows, although it lacks the hypertrophy and necrosis of the phloem usual in this group of virus diseases, and produces an unusual hypoplasy of the bast fibres. It differs from the leaf curl disease of cotton in the Sudan in the following points: in Azerbaijan the diseased leaves tend to curl upwards, the palisade parenchyma is more strongly developed than in healthy plants, no additional cylinders are formed in stems and petioles, and the bast fibres are hypoplastic; in the Sudan the diseased leaves mostly curl downwards, the palisade parenchyma is either under-developed or not developed at all, and additional cylinders are formed in stems and petioles. It is suggested that the two diseases are distinct, and it is proposed to name that in Azerbaijan "leaf roll" and the virus causing it, according to K. M. Smith's classification, *Gossypium* virus 2, Verderevsky.

L. K. Kara-Murza (pp. 197-202) found in a physiological study of the Azerbaijan virus disease of cotton that the leaves of diseased plants contain less total and albuminous nitrogen and both leaves and petioles have more carbohydrates, particularly starch, than those of healthy plants, the amount of carbohydrates in the reproductive organs and in the stem walls being, on the other hand, smaller; furthermore, the accumulation of dry matter is less intense and the amount of chlorophyll smaller.

438. Use of Liquid Culture of Fusarium for Field Inoculation of Cott[illegible] By C. D. Sherbakoff *et al.* See Abstract 469.

GENERAL BOTANY, BREEDING, ETC.

439. Teaching of Plant Genetics. (*Nature*, 15/7/44.) On February 20, 1943, Dr. W. Burns, Agricultural Commissioner with the Government of India, delivered his presidential address to the Indian Society of Genetics and Plant Breeding on the subject of the teaching of plant genetics in India. His comprehensive survey and discussion on this question, based as they are on a wide experience of the application of genetics to Indian agriculture, call for consideration in some detail. Dr. Burns thinks that the rudiments of genetics should form part of the liberal education of those who proceed beyond the secondary school, because our behaviour and reaction to many situations must be profoundly affected by our understanding of the part played by heredity. A general raising of the level of biological teaching in schools is one of the essential prerequisites of teaching genetics, and would enable "the future citizen, administrator or specialist to handle problems dealing with living things, including man, less ignorantly." The specialist in biology, medicine or agriculture requires, of course, a wider knowledge of genetics, since there are few biological problems the genetical aspects of which can be safely neglected. The plant breeder must have available to him all the resources of genetical science. Genetical teaching is bound to be affected by the rapid and, in some ways, uneven growth of the subject. The necessary perspective could be introduced by a short historical survey. Elementary courses in genetics should aim at making clear the basic concept of the genotype and the chromosome theory of heredity, and should be preceded by a botany course and an introduction to biometrical mathematics. Instruction in cytology should be included in the botany course, and should involve the making of simple preparations of dividing nuclei. Practical work in elementary genetics itself would of necessity be largely on prepared material in the laboratory. The biological specialist requires an additional preliminary course in floral biology to acquaint him with the structure and action of different floral mechanisms, the operation of incompatibility, and the methods used in making controlled pollination by artificial means. The genetical course itself should begin with a biometrical study of naturally occurring variation, proceeding via the distinction between heritable and non-heritable variation to Mendelism and chromosome theory. The student should count segregating families and so be led to an understanding of sampling variation and tests of goodness of fit. Finally, the bearings of genetics on evolutionary theory and taxonomy should be made clear, with special reference to complex, or polygenic, inheritance. This would require that the teachers themselves should have studied the problem carefully, and should have "some form of belief and not merely a chaos" in their minds. Dr. Burns also recorded a protest against the tyranny of the herbarium method and a plea for a fuller study of living plants in taxonomy. With reference to the plant breeder, it is clear that he should receive a fuller mathematical training than the other classes of student, for otherwise he must acquire it "painfully, perhaps self-taught," at a later and less convenient stage. He should also have a more comprehensive course in genetics, though it could be modelled on the lines sketched earlier. He would require an introduction to the modern theory and practice of field experiments, with practical work involving responsibility for an actual trial. The part to be played by statistics was discussed in relation to the danger of an undue adherence to statistical methods leading to a neglect of the living plants. The solution is essentially that of training the breeder to rely primarily on observations of, and familiarity with, his crop; and to show him how his observations can be amplified and checked by statistical analyses. Dr. Burns concluded with a survey of the present position of genetics teaching in India, which he found far from satisfactory. He advocated the giving of preliminary instruction in the universities and of advanced courses in agricultural institutes. Above all, if this genetical teaching is to be fruitful the students must [illegible]ed to grow plants and study them as living things. The provision of facilities fo[illegible] should not be too great a tax on the resources of educational establishments;

but there is a need for a small hand-book of practical genetics using the plants, chillies, rice, etc., with which Indians are familiar. This discussion of teaching in plant genetics is noteworthy in a variety of ways, but especially perhaps for its insistence on the following points: (1) The argument for a wider teaching and appreciation of general biology and the genetical point of view; (2) the introduction of perspective into genetics by the approach through observable variation in Nature and the linking of genetics to evolutionary theory and taxonomy; (3) the need for preliminary courses in floral biology and mathematics, and the introduction of modern statistical methods into the teaching; (4) the emphasis on relating genetics teaching to the living organism as a corrective to over-formalization. It must be remembered that Dr. Burns was discussing plant genetics in India, and so his various points may not apply with equal emphasis to all genetics in all countries. His separation of cytology from genetics and its inclusion in the botany course, for example, will not be desirable everywhere. Nevertheless, his conclusions and proposals merit the careful study of all who are concerned with genetics and its teaching. His remarks are indeed especially timely in view of the expansion of genetics and genetical teaching which must now be contemplated in Great Britain.

440. The Application of Genetics to Plant Breeding. By S. G. Stephens. (*Trop. Agr.*, July, 1944, p. 126.) In considering the application of genetics to plant breeding methods it must be remembered that the art of crop improvement originated in prehistoric times—probably soon after the human race passed from the nomadic food gathering phase into a stage of settled communities. The birth of genetics as a science, therefore, in 1900 found all the chief agricultural crops already highly improved as a result of thousands of years of conscious or unconscious selection by man. To-day when one compares a cultivated crop with its nearest wild relatives, it is difficult to believe that post-Mendelian improvement will be in any way commensurate with the advances which have gone before. In certain crops, special characters can be recognized whose incorporation has obviously been of primary importance to successful cultivation, and in all cases these characters must be of extremely ancient origin. The non-shattering rachis of wheat, the non-articulate grain base in oats, the peculiar type of inflorescence found in cultivated maize, the convoluted (and hence spinnable) hairs of cultivated cottons, the parthenocarpic (and hence edible) fruit of the banana may all be cited as characters of ancient origin and of major importance to man, which are present in the cultivated species but absent from their nearest wild relatives. However, the fact that, from the present-day perspective at any rate, the most significant improvements on the wild ancestor have already been achieved need not engender a pessimistic outlook for the future. What *is* important is the realization that further improvement, in the absence of novel mutations of practical importance, demands the fullest use of existing scientific methods and the invention of new ones if it is to be worth while. Genetics in its early days was confined to factorial interpretations of the simpler types of breeding behaviour—*e.g.*, the inheritance of flower and seed colours. The subsequent recognition that most characters of agricultural importance have a much more complex nature has meant that until recently genetics has made little direct contribution to plant-breeding technique. In other directions, however, genetics has advanced rapidly. It may perhaps be argued that its advance has been greatest when its general principles have been incorporated with specialized knowledge of other scientific disciplines (1) with cytology and taxonomy in order to throw light on the mechanism of speciation, (2) with statistics to open up new fields in studies of human inheritance and in examining possible methods of evolution as a whole, and (3) with physiology and embryology to gain an understanding of growth and development. It is the object of the author in this paper to summarize, from the economic point of view, the most important aspects of these three lines of development and to show that they are of significance to the plant breeder.

441. The Course of Genetics. By Y. Umeya. (*Bot. and Zool.*, **6**, 1938, p. 765. From *Pl. Bre. Abs.*, xiv., **3**, 1944, p. 195.) Experimental genetics is critically discussed from two aspects, as a pure science and as an applied science.

442. A Brief Account of the Fundamentals of Genetics. By H. L. K. Whitehouse. (*Sch. Sci. Rev.*, **95**, 1943, p. 77. From *Pl. Bre. Abs.*, xiv., **2**, 1944, p. 92.) An elementary account of the cytological processes determining genetical behaviour is presented. Mitosis, meiosis and sex determination are described, and the final sections deal with linkage.

443. Memoirs of the Cotton Research Station, Trinidad. (Pubd. by the Empire Cotton Growing Corpn. Price 2s. 6d.) The twenty-third number of Series A, Genetics, has recently been published, and contains the following paper reprinted from the *Journal of Genetics*:

The Genetics of Species Development in the Old World Cottons. By R. A. Silow. On the basis of the several distinct levels of divergence which have been analysed in the genus, it may be said that extent of taxonomic divergence, below the level at which chromosomal rearrangements become important, is closely paralleled by the magnitude of differences in genotype. Genetic differences between the species examined were only distinguished from those associated with regional divergence within them by their greater magnitude. Neither species nor races are in a static condition of equilibrium, but are characterized by a dynamic state of flux. The genetic basis of all morphological characters and physiological functions is subject to continual change, but complete continuity in variation is not found in nature. The genes are selected, not only for their value in relation to the external environment, but also on the basis of their compatibility with the entire genotypic system. Though innumerable gene combinations are theoretically possible, as a result of this internal selection pressure only particular assortments, harmonically co-ordinated in their interaction, become established. During the process of the integration of the small initial variations in gene frequency which distinguish geographic races, into the larger collective differences found between species, physiological isolation barriers also become established. Even here there is no indication of the qualitative distinction which is implied in Goldschmidt's (1940) assertion that species dissimilarities are on a completely different level of organization from racial ones. In this connection attention may be directed to the particularly cogent criticism which has been made with reference to Harland's conclusions, that the entities which he contrasted, *barbadense* and *hirsutum*, might not be good species. Exactly the same criticism might be levelled against the *arboreum-herbaceum* distinction, although our reasons for thinking that they are good species, especially their absolute integrity in nature, have already been advanced. But this criticism could not possibly, by any stretch of imagination, be extended to *anomalum*, which, on all criteria, must be regarded as an absolutely first-class species. It may well be argued that, if physiological isolation is built up by cumulative gene changes, it should be possible to identify it in the early stages of its development within species. Yet the recognition of any lesser degree of sterility than that which exists between *arboreum* and *herbaceum* presents immense technical difficulties. Surely it is just here, where the taxonomic status of these two entities is in question, that the antagonists of the theory of the gradual evolution of species must make a concession. For if these are not good species, then they provide just that evidence of the incipient development of sterility that is required to clinch the argument that physiological isolation also is built up by a gradual process. The precise taxonomic status of *arboreum* and *herbaceum* is beside the point. It can only be emphasized that they are discrete entities between which there is little or no gene interchange in nature, and that hybridization leads to the complete mutual disintegration of their respective co-ordinated gene systems. So long as these entities have not acquired the complete intersterility which the systematist likes to associate with the full species distinction, there will be those who will say they are not good species. The indeterminate position which exists, and which is by no means confined to this genus (*cf.* Clausen, Keck and Hiesey, Publ. Carnegie Instn. No. 520, 1940), is just what would be expected on the Neo-[illegible]ian theory of evolution. If *arboreum* and *herbaceum* are not yet full species, [illegible] are very definitely in the process of becoming such. It may be concluded

that all of the several taxonomic distinctions which have been analysed in this genus, up to the complete sterility level associated with full specific status, but below the level at which chromosomal rearrangements become important, can be accounted for entirely by the cumulative effects of many gene differences. Of any macro-evolutionary hiatus in the orderly progression from geographic race to full species there is no evidence whatsoever.

444. Memoirs of the Cotton Research Station, Trinidad. (Publd. by the Empire Cotton Growing Corpn. Price 2s. 6d.) The twenty-second number of Series A, Genetics, has recently been published, and contains the following paper reprinted from the *Journal of Genetics*:

The Genetic Organization of Leaf-Shape Development in the Genus *Gossypium*. By S. G. Stephens. Leaf shape in *Gossypium* is controlled by a series of multiple alleles. Since most leaf types in the genus pass through relatively long juvenile periods they provide particularly good material for developmental genetic study. By plotting logarithmically the dimensions of fully expanded leaves at successive nodes on the main stem, "developmental tracks" may be constructed which are characteristic for each allele. Developmental tracks of all lobed-leaved types throughout the genus can probably be induced to pass through three phases: *Phase A:* A linear phase, in which leaf length, sinus length and lobe width develop at equal rates ($K=1$). During this phase the leaf is entire. *Phase B:* A transition phase in which development of leaf length and sinus length shows a non-linear relationship. During this phase "sinus fields"—*i.e.*, localized areas of restricted growth—are established in the leaf primordia (K values vary continuously). As a result the entire is converted into a lobed-leaf pattern. *Phase C:* A second linear phase in which leaf length, sinus length and lobe width develop allometrically (K stabilized at <1). In this phase each allele has its characteristic K value. Entire-leaved types remain in phase A during their normal developmental (pre-flowering) period. In the New World amphidiploid leaf types, and in the wild diploids, *G. thurberi* and *G. anomalum*, development is normally arrested during phase B. In the Asiatic cultivated types phases A and B are completed in the early seedling stages and development continues in phase C. A mathematical relationship between leaf growth and leaf development is demonstrated. The latter may be regarded as a recapitulation of the former—complete recapitulation in the case of entire-leaved types, modified recapitulation in lobed-leaved types. The alleles which control this growth and developmental mechanism do so by varying the rate and extent of change in leaf pattern, and also by varying the "timing" of the pattern change initiation in relation to the general developmental processes of the plant.

445. The Genetics of Blackarm Resistance. IV. *Gossypium punctatum* (Sch. and Thon.) Crosses. By R. L. Knight. (*J. of Genet.*, xlvi., **1**, April, 1944.) BAR 3, a strain of *G. punctatum* showing grade '1' - '2' resistance ('0' = immunity; '12' = full susceptibility), contains two linked blackarm resistance genes, $\mathbf{B}_2$ and $\mathbf{B}_3$. $\mathbf{B}_2$ is the gene responsible for resistance in *hirsutum* varieties; $\mathbf{B}_3$ is a new, semi-dominant factor which confers grade '7·1' - '8·1' resistance on Sakel (*G. barbadense*) when heterozygous and grade '4·1' - '7·1' when homozygous. Neither minor nor modifying factors are present in BAR 3 in sufficient strength to have any marked effect. $\mathbf{B}_2$ and $\mathbf{B}_3$ are additive, $\mathbf{B}_2\mathbf{b}_2\mathbf{B}_3\mathbf{b}_3$ and $\mathbf{B}_2\mathbf{B}_2\mathbf{B}_3\mathbf{b}_3$ plants showed resistance of about grade '4.' $\mathbf{B}_2\mathbf{b}_2\mathbf{B}_3\mathbf{B}_3$ and $\mathbf{B}_2\mathbf{B}_2\mathbf{B}_3\mathbf{B}_3$ plants showed grade '3' resistance when the factors were transferred to a Sakel genotype. $\mathbf{B}_3$ and $\mathbf{B}_1$ (the latter derived from the American Upland strain Uganda B31) also showed marked additive effect, $\mathbf{B}_1\mathbf{B}_1\mathbf{B}_3\mathbf{b}_3$ and $\mathbf{B}_1\mathbf{b}_1\mathbf{B}_3\mathbf{b}_3$ 'Sakel' plants possessing grade '4' - '6' resistance. Factors $\mathbf{B}_2$ and $\mathbf{B}_3$ are linked and showed 32·4 per cent. cross-overs in the first four backcrosses, with a resistant : susceptible ratio of 1·96 : 1 against a 3 : 1 dihybrid expectation. The straight F_2 and F_2's of early backcrosses gave good approximation to the 7·8 : 1 ratio expected with 3[illegible] per cent. cross-over, except that some families in the straight F_2 showed the [illegible]sion ratio. Later backcrosses and later backcross F_2's showed a loss of linkage [illegible]ulted

to replacement of the *punctatum* segment of chromosome between B_2 and B_3 by *barbadense*, thus permitting greater freedom of crossing-over and making the recombination value approach 50 per cent. The resistance of Gambia Native, another *punctatum* strain, is also due to B_2 and B_3, but Gambia possesses, in addition, a number of minor factors, and crosses between Gambia and Sakel showed blending inheritance in F_2. Both resistant and susceptible strains of Hindi Weed cotton occur. Resistant selections contained B_2 unaccompanied by weak factors. B_2 in the Hindi genotype produced a slightly heightened resistance attributed to modifying factors. Darfur Local, a cultivated *punctatum* from the western Sudan, was heterogeneous for resistance but gave evidence of the presence of B_3 and, assumedly, of B_2 also. Kadugli Local, a semi-wild *punctatum* from Kordofan Province, Sudan, showed marked (grade '4') resistance, but no genetical analysis has as yet been made.

[*Cf.* Abstrs. 232, Vol. XVII. and 174, Vol. XVIII. of this Review.]

446. BIBLIOGRAPHY ON INSECT PEST RESISTANCE IN PLANTS (WITH A SUPPLEMENT ON RESISTANCE TO NEMATODES). (Pubd. Imp. Bur. of Pl. Gen., Cambs., 1944. Price 1s. 6d.) As plant breeding and genetics progress and the general standard of crop production and quality rises, the question of selection of types for their resistance to damage by insect pests advances more and more in the foreground in any programme for the improvement of agricultural crops and other economic plants. Evidence of this trend of research is seen in the work conducted during recent years on the cotton plant, which has been found to be subject to attack by so many insect pests and other organisms. That resistance to such pests might have a morphological or a physiological basis has been recognized, and work on these two aspects has yielded a considerable body of evidence on the problem; the present bibliography (which arose primarily out of an enquiry received on the relation between hairiness and jassid resistance in cotton) presents an up-to-date survey of the more recent findings, and also the results of some earlier work on the subject of plant resistance to insect pests and nematodes, regarded from the point of view of the plant breeder and the geneticist. The sources drawn upon include publications from the British Commonwealth, the main European countries, U.S.A., various South American countries, U.S.S.R., and Japan. The bibliography with its supplement contains over 550 references, which are arranged according to subject. Many of the publications included have been abstracted in *Plant Breeding Abstracts*, and in many instances the original publications cited are available at the Bureau or in some co-operating library, and further information can therefore, if necessary, be obtained on application to the Bureau. With the collaboration of the Imperial Bureau of Pastures and Forage Crops, Aberystwyth, it was possible to include in the main list a number of papers on forage crops which have been abstracted in the journal, *Herbage Abstracts*, issued by that Bureau; while for the supplement on nematode resistance a number of references were contributed by the Imperial Bureau of Agricultural Parasitology, St. Albans.

447. LA NOTION D'ESPÈCE ET LA GÉNÉTIQUE (THE SPECIES CONCEPT AND GENETICS). By E. Rabaud. (*Sciences*, Paris, 1940, **67**, p. 85. From *Pl. Bre. Abs.*, xiv., **3**, 1944, p. 198.) The genetical, which takes into consideration the physical-chemical point of view, offers a new and fruitful approach towards a definition of a species. How valuable the morphological characters may be for classification, only the biochemical structure of the organism can show, for in this consists the real difference between various external characters. Only a biochemical analysis is able to explain the conditions for fertile and sterile crosses. Various investigations on plants have up to the present given good results.

448. CYTOGENETIK (CYTOGENETICS). By J. Straub. (*Fortschr. Bot. Berl.*, **10**, 1941, p. 246. From *Pl. Bre. Abs.*, xiv., **3**, 1944, p. 198.) The problem of the contrast in performance between the experimentally produced autopolyploids and the natural polyploid forms is discussed and the question of the positive selection value of duplicated genomes which follow therefrom. A study of haploids is also included. The second problem is the relation between chromosome and gene. The investigations in this connection include the action of X-rays, an analysis of segmental inter-

change and chiasma formation as well as the method and influence of crossing-over. The nature of the gene also comes in for discussion.

449. MORPHOLOGIE UND ENTWICKLUNGSGESCHICHTE DER ZELLE. By L. Geitler. (From *Gartenbauwiss.*, **17**, 1942, p. 14. *Pl. Bre. Abs.*, xiv., **2**, 1944, p. 117.) Deals with the new developments in general cytology, including work on the experimental basis of the mechanics of mitosis and meiosis, the finer structure of the chromosomes and the resting nucleus and "the inner polyploidization" in plant tissues.

450. CHEMICAL CONTROL OF MITOSIS. By P. T. Thomas and R. Drew. (*Nature*, **152**, 1943, p. 564. From *Pl. Bre. Abs.*, xiv., **2**, 1944, p. 92.) Ethyl mercuric chloride has been found effective in inducing *c*-mitosis and polyploidy. Used alone, its efficiency in this respect is only slight, but in conjunction with 1 : 2 : 5 : 6-dibenzanthracene its effect is pronounced. This example of complementary action by two substances may have important theoretical and practical consequences.

451. A STUDY OF AMMONIA AND NITRATE NITROGEN FOR COTTON, V, VI. By K. T. Holley and T. G. Dulin. (*Ga. Exp. Sta. Bull.* 229, 1943. From *Exp. Sta. Rec.*, **90**, 6, 1944, p. 750.) V. *Influence of variety.* Comparison of ammonium sulphate and of nitrates as N sources for cotton, made in water cultures, showed that the early-maturing Stoneville No. 2 did not utilize ammonium salts as well as Durango cotton. Variety evidently should be considered in comparison of N sources.

VI. *Influence of certain factors on fruiting.* The boll production phase of ammonia and nitrate N nutrition was given special attention, 1936-41, with consideration to acid-base balance, reduced phosphate supply, reduced aeration, sugar concentrations, reduction of O supply to roots, higher salt concentration in the fruiting period, leaf development, NaCl additions to solutions, boll-carrying capacity of plants, and additional trace elements. Even with improved space and volume relations, no treatment to 1941 had marked effect in increasing fruiting of plants grown with ammonium sulphate as the N source. The fact that field plants of such size have carried many more bolls suggested failure to meet fully in these experiments requirements of maximum fruiting. Allowance, however, should be made for the longer growing seasons of field plants in comparison with these experimental plants, which were limited to 118 days. Even with one plant in each container plants evidently were badly crowded after fruit development began, and leaf area measurements demonstrated inefficiency of the leaf area as a whole in photosynthesis. Factors directly concerned with photosynthetic efficiency of the leaf are considered as a possible fruitful field of investigation in relation to vigour and efficiency of the cotton plant. The results showed that cotton plants can make good vegetative growth, and fruit fairly well at low phosphate concentrations. More evidence was provided to show that plants grown in nitrates as the N source contain more organic acid, but that the excess inorganic base is associated with more inorganic anions than with plants grown on ammonium sulphate media. There was some indication that excess of base over acids in cotton leaves tends to be similar with either N source.

[*Cf.* Abstrs. 553, Vol. IX., 432, Vol. XII., and 461, Vol. XIV. of this Review.]

452. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The twenty-first number of Series A, Genetics, has recently been published, and contains the following paper reprinted from the *Journal of Genetics*:

THE INHERITANCE OF LINT COLOUR IN ASIATIC COTTONS. By R. A. Silow. Lint colour in the cultivated Asiatic diploid species *Gossypium arboreum* and *herbaceum* is determined by main genes at three loci, $\mathbf{Lc_1}$, $\mathbf{Lc_2}$ and $\mathbf{Lc_3}$, and by a variable complex of minor genes. At $\mathbf{Lc_1}$ only one brown gene, a khaki, was identified. $\mathbf{Lc_1^K}$ is nearly fully dominant, not subject to modifier displacement in interspecific crosses, and only slightly subject to fading. Occasional mutations to white have been observed, with a frequency of about 1 in 70. At $\mathbf{Lc_2}$ a multiple allelomorph series occurs, khaki, medium brown, light brown, and white—$\mathbf{Lc_2^K}$, $\mathbf{Lc_2^M}$, $\mathbf{Lc_2^B}$, $\mathbf{Lc_2}$. $\mathbf{Lc_2^K}$ may be regarded as a duplicate of $\mathbf{Lc_1^K}$, except for a slightly lower degree of dominance. $\mathbf{Lc_2^B}$ is of low dominance,

and highly susceptible to modifier displacement and to fading. At Lc_3 only one brown gene, a light brown, was identified. Lc_3^B is an indistinguishable duplicate of Lc_2^B. The brown genes are cumulative in effect. When Lc_2^B and Lc_3^B occur together in homozygous phase their expression is darker than that of a khaki allele. Homozygous Lc_2^B also raises homozygous Lc_1^K to the same intensity, but a light brown does not make any discernible difference to the expression of a khaki when both are heterozygous. A single light brown at each of the Lc_2 and Lc_3 loci has the same phenotype as either of the light browns in the homozygous phase. In the common high-level *arboreum* genotype main colour genes grade as follows:

	Homozygous.	*Heterozygous.*
Lc_1^K	3	2
Lc_2^K	3	1·8
Lc_2^M	2	1·5-1·2
Lc_2^B or Lc_3^B	1·8	1·2-0·8
$Lc_1^K+Lc_2^B$	4	2
$Lc_2^B+Lc_3^B$	4	1·8

As a result of the high dominance of the khakis, and their stability on exposure, both F_2 and backcross progenies segregating for them show comparative uniformity in the coloured class. Where the light browns are concerned, their susceptibility to fading leads to considerable variability in the coloured class in a backcross, and their low dominance accentuates this in a selfed progeny. Nevertheless, within *arboreum* browns are usually quite distinct from whites, seldom fading below grade 0·5; but where modifier segregation occurs, as in most interspecific crosses, there is complete integrading between brown and white. Lint-colour intensifiers have no colour expression on their own account in the absence of a main colour gene. Lc_1 is linked with the leaf-shape locus **L**. The cross-over value within *arboreum* was 28·7 per cent.; in interspecific crosses it was significantly lower, 24·5 per cent. The curly locus, **Cu**, lies approximately midway between Lc_1 and **L**. Lc_2 is linked with the glabrous lintless locus H_a, with approximately 7 per cent. crossing-over (interspecific estimate). Lc_3 is linked with the corolla colour locus Y_a, with approximately 24 per cent. crossing-over (interspecific estimate). The normal cross-over value was maintained in a cross between a strain carrying $LLLc_1^K$ and a strain carrying **l** lc_1 which had been derived from it by mutation. Lc_1 and Lc_3 were each shown to be independent of 16 other main loci, and Lc_2 independent of 11 main loci.

Association of lint colour with other economic characters. Colour is associated with a decrease in lint length. Differences in seed size, lint quantity and boll size associated with segregation at Lc_1, and in seed size and lint quantity associated with segregation at the Lc_2 and Lc_3 loci, present in some crosses examined, were of variable magnitude and were not always associated with colour in the same direction. These differences are ascribed to linked quantitative genes rather than directly to the colour genes as in the case of lint length. The latter association is probably physiological in nature, and not an instance of true gene pleiotropy.

The lint colour genotype in Gossypium arboreum. Twenty of the twenty-four coloured strains in the *arboreum* type collection of 150 strains were examined genetically. Their lint colour ranged from dark brown through khaki to light brown and grey. Data are presented on both a genetic and taxonomic basis. By far the greater part of the range in colour was referable to alleles at the Lc_1 and Lc_2 loci. It was not determined whether the three occurrences of alleles at a third locus were referable to Lc_3. Brown genes are equally common at Lc_1 and Lc_2, are widespread geographically, but outside the Bengal-Burma major centre of variability and Peninsular India, only sporadic in occurrence. Though Lc_1^K is most common in Burma, and only Lc_2 browns were found in China and Peninsular India, there was no evidence that browns at one locus occur to the exclusion of those at the other in any particular locality. The darker alleles at Lc_2 were only identified in Bengal and China, and are less common than the light brown allele. The modifier genotype was also investigated in twelve representative white-linted strains. In most

arboreum strains the minor genotype was at a high level, intensifying the expression of main colour genes when present. In Peninsular Indian representatives, both coloured and white, the level was low and variable; there was also evidence of some modifier variability in Bengal.

The lint-colour genotype in Gossypium herbaceum. By contrast with the position of *arboreum*, most *herbaceum* types have very light brown, grey, creamy or dull white lint. Fourteen of the twenty-two *herbaceum* strains in the Trinidad type collection fall into this category. All carried **Lc_2^B** in a medium low and slightly variable modifier background in the *africanum* section of the species (five strains), an even lower modifier level in var. *frutescens* (two strains), and a very strongly suppressing genotype in var. *typicum* (seven strains). Four dark-brown linted strains, all var. *typicum*, carried duplicate light brown genes, one of them **Lc_2^B**. In two of these strains the second gene concerned was **Lc_3^B**; in the other two strains it was not demonstrated that the second gene was at this locus, but this was highly probable. These four dark brown strains were at a high modifier level, much as in the majority of *arboreums*. Only four of the twenty-two *herbaceum* strains lacked a main lint-colour gene (two *typicum*, two *frutescens*). The minor genotype of one of these four strains was investigated and found to be at the same level as that of other strains from the same taxonomic group which carried a suppressed main colour gene. Although those strains which carried a suppressed main gene were very slightly off-white, they could only be distinguished with confidence from those which did not by the occurrence of intensification in interspecific progenies involving high-level white *arboreums*. There was no evidence that the **Lc_1** locus is concerned with lint colour in *herbaceum*, and no khaki genes were found in the species. Part of the distinction in minor lint-colour genotype between the low-level *herbaceums* and Peninsular Indian *arboreums* on the one hand, and the high-level *arboreums* on the other hand, is associated with the **P_a** (pollen colour) chromosome. There was no evidence that any lint-colour modifiers were located near the **$Ne\text{-}P_b$**, **Y_a** or **R_2** loci.

Lint colour in the New World cultivated cottons. The literature pertaining to the inheritance of lint colour in the tetraploid New World species *hirsutum* and *barbadense* is reviewed. Although these species have been less extensively investigated, it is suggested that the lint-colour situation in them shows a striking parallelism with that in the Asiatic cottons, main colour genes being uncommon in *hirsutum* except near the centre of origin, but the species as a whole at a high modifier level, whilst in *barbadense*, especially the modern slightly creamy Egyptains and Sea Islands, there is a prevalent main brown gene and a strongly suppressing modifier background.

453. Inheritance of Green and Brown Lint in Upland Cotton. By T. R. Richmond. (*J. Amer. Soc. Agron.*, **35**, 1943, p. 967. From *Pl. Bre. Abs.*, xiv., **2**, 1944, p. 142.) The genetical behaviour of lint pigmentation has been studied, using the following varieties: Texas Green Lint, Nankeen (dark brown lint), Texas Rust (light brown lint), Higginbotham (light brown lint), and a normal white-linted variety. Pigmentation of the first three varieties is conditioned by a single gene which is incompletely dominant to white. The genes for Texas Rust and Nankeen are allelic and appear to be independent of Texas Green Lint and Higginbotham, which are also independent of each other. An association was observed between the green and brown lint genes and a reduction in the weight of fibre per unit length.

454. Cotton Breeding in relation to Taxonomy. By T. H. Kearney. (*Proc. 8th Amer. Sci. Congr., Wash.*, **3**, 1940, p. 251. From *Pl. Bre. Abs.*, xiv., **3**, 1944, p. 227.) The difficulties attending the search for the wild prototypes of cultivated cottons are considerable, firstly, because cotton was grown and widely distributed in prehistoric times, and secondly, because many types are intercompatible and hybridize with ease. It is possible that the original ancestors no longer exist, and there is reason for believing that many and perhaps all of the wild linted species are escapes from types formerly cultivated. Systematic study of the group is not easy, especially as hybridization gives rise to many distinctive phenotypes. It is suggested that only a fifth of the 160 species listed in "Index kewensis" are worthy of specific status. The difficulties in determining specific distinctions do not apply,

however, to the wild lintless species, for these are usually well-defined. The lintless types are most frequently found in rugged habitats; they have 26 chromosomes and are only distantly related to each other. Crossing is difficult to accomplish. Sterile hybrids usually result from hybridization between wild and cultivated species, but fertile crosses can easily be obtained from interspecific crosses within the American or Asiatic groups. No valuable types have so far resulted from interspecific hybridization in contrast to the successes resulting from intraspecific crossing. The origin of S × P cotton is traced in order to illustrate the value of the last-named method.

455. Memoirs of the Cotton Research Station, Trinidad. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The sixteenth number of Series B, Physiology, has recently been published, and contains the following papers reprinted from the *Annals of Botany*:

Studies on Foliar Hydration in the Cotton Plant. III. Preliminary Observations Using the Pruning Method. By E. Phillis and T. G. Mason. Advantage has been taken of the known fact that defoliation influences the size and water content of the leaves that remain on the plant, to investigate further the relation between electrolytes and hydration. An experiment is described in which the effects of partial defoliation upon the remaining leaves of a plant supplied with a full nutrient solution were investigated. It was found that pruning caused increases in the water, dry weight, and protein contents, but only small changes in depression of freezing-point and conductivity of the sap. Difficulties in the interpretation of the results of experiments of this type are pointed out. A second experiment is described in which the confusing effects of variable water strain and of variable nutrition were removed. Plants grown in a full nutrient solution were partially defoliated and transferred to calcium chloride solutions, and subsequent changes in the remaining leaves noted. Under these conditions, the uptake of water by the leaves was proportional to the increase in calcium chloride content. It is pointed out that the behaviour of leaves on pruned plants supplied with a full nutrient solution is similar to the behaviour of *discs* floated on a full nutrient solution and that *leaves* on a pruned plant supplied with calcium chloride solution behave like *discs* floated on such solutions. It is not certain whether the *total amount* of salt or its *concentration* in the sap is the more important factor controlling hydration. Before this matter can be settled, much more must be known of the manner in which salts act in controlling hydration.

IV. The Influence of Composition and Concentration of Nutrient Solution. By T. G. Mason and E. Phillis. Three experiments are described. The object of these experiments was to ascertain to what extent changes in the composition and concentration of the nutrient supply affected foliar hydration and how such changes in hydration were brought about. Previous results have led us to suggest that the weight of water in the leaf is determined by two factors. The first is the *weight* of anhydrous protoplasm (the Bulk Factor), and the second is the *hydration capacity* of protoplasm. We have also postulated that the hydration capacity of protoplasm is controlled by its salt content. In the first experiment the nutrient varied both in composition and in concentration. Water in the leaf was significantly correlated with both dry weight and protein, which we have used as indicators of anhydrous protoplasm. When this "Bulk Factor" was removed by expressing water in terms of dry weight and/or protein, hydration was significantly and positively correlated with sap conductivity. The results are fully in accord with the salt hypothesis of foliar hydration. No evidence of a specific effect of any single element on hydration was detected. In the second experiment the concentration of the nutrient solution was varied. Again hydration and sap conductivity were strongly correlated. Old leaves were found to have higher conductivities and higher hydration than young leaves. It was also observed that conductivity was more strongly correlated with hydration than was freezing-point depression of the expressed sap. The correlation between freezing-point depression and hydration was appreciably increased when the freezing-point depression was corrected for the concentration of sugar in the sap. In the third experiment there

was a wide range of nitrogen supply. Sap conductivity and hydration were negatively correlated on the dry-weight basis and positively correlated on the protein basis. The causes of this difference are discussed. When the data for the three experiments are combined the correlation between hydration in terms of dry weight and sap conductivity is positive and surprisingly high. Over the wide range of nutrient supply covered by these three experiments it would seem that hydration is chiefly determined by the level of salt concentration.

V. A Further Experiment with Potassium. By E. Phillis and T. G. Mason. The plants were grown with varying potassium supply under "Wet" and "Dry" conditions. Dry weight of whole plant, hydration in the leaf and in the bark (in terms of dry weight and of protein), and the specific conductivity of leaf and bark sap were determined. It was found under "Wet" conditions and also under "Dry" conditions that as long as increases in potassium supply caused little or no further increases in dry weight, increased potassium supply caused increased hydration. This increased hydration was associated with increased sap concentration. Thus the effect of potassium on hydration falls into line with the salt concentration hypothesis of hydration. Size of plant *per se* affects the hydration of the leaves under "Dry" conditions. It also affects the hydration under "Wet" conditions as the plants age, possibly as a result of an increase in resistance to the movement of water within the plant. Hydration in the bark undergoes very similar changes to those in the lamina in response to changes in potassium supply.

Studies on the Partition of the Mineral Elements in the Cotton Plant. IV. More about Nitrogen, Phosphorus, and Labile Carbohydrate. By T. G. Mason and E. Phillis. The relation between crystalloid-N and protein-N has been investigated in an experiment in which nitrogen supply was varied from acute starvation to considerable excess. The crystalloid-N concentration (in terms of dry weight) rose continuously with increasing supply, while the protein concentration rose to a maximum value and then declined. The relation between crystalloid-N and protein-N follows an adsorption (apolar) pattern. In a second experiment, phosphorus supply was varied from acute starvation to excess. The concentrations of both sap-soluble and insoluble phosphorus rose continuously with increasing supply. It had been anticipated from previous experiments that insoluble phosphorus would decline as the phosphorus supply reached high levels, but no such decline was noted in the present experiment. The data of this and of previous experiments considered together are in harmony with the view that the relation between soluble and insoluble phosphorus is of the same type as that between crystalloid-N and protein-N. The relation between crystalloid-N and protein-N remains relatively constant from experiment to experiment in spite of widely divergent conditions, but this does not appear to be so in the case of phosphorus, where the soluble/insoluble phosphorus relation changes markedly from experiment to experiment. It is pointed out that most of the nitrogen in the leaf is present in organic form, while much of the phosphorus is present as phosphates. It is also shown that the relation between starch and sugar is controlled by factors quite unlike those that prevail for nitrogen and phosphorus.

456. Translocation of Radiophosphorus in the Phloem of the Cotton Plant. By O. Biddulph and J. Markle. (*Amer. J. Bot.*, **31**, 2, 1944, p. 65. From *Exp. Sta. Rec.*, **91**, 2, 1944, p. 138.) Radiophosphorus was found to move via the phloem in travelling from the leaf to other parts of the plant, the rate downward being in excess of 21 cm. per hour. As it entered the phloem of the stem from the injected leaf a concentration gradient was established extending both upward and downward from the point of entry. This suggests a pattern of movements analogous to those of simple diffusion, but the rate was much too great to be thus accounted for. Upward movement in the phloem varied from practically none to over 40 per cent. of the mobile phosphate, suggesting that some unknown internal factors may control both rate and direction of movement. In moving from the leaf via the phloem, P may diffuse quite readily into the xylem and reascend the stem with the transpiration stream, thus maintaining a "circulation" within the plant.

457. A TECHNIQUE FOR TESTING RESISTANCE OF COTTON SEEDLINGS TO THE ANGULAR LEAFSPOT BACTERIUM. By R. Weindling. (*Phytopathology*, xxxiii., 2, 1944, p. 235. From *Rev. App. Mycol.*, xxiii., 8, 1944, p. 299.) The technique devised by the writer at the South Carolina Agricultural Experiment Station for testing the resistance of cotton seedlings to angular leafspot involved the inoculation of the seed of 20 varieties in suspensions of the pathogen for periods of 5 minutes and 3 hours and growing the resultant seedlings for 3 weeks at 27° to 35° C., the relative disease rating being based on the severity and speed of development of the lesions. In general, the varietal reactions of the seedlings tested under these conditions agreed with those of field plants. Thus, the percentages of infection in five representative varieties—viz., S×P Egyptian (extremely susceptible), Shafter Acala (highly susceptible), Rogers' Acala (moderately susceptible), Stoneville 4-5 (tolerant), and Stoneville 4-8 (resistant)—for the short and long inoculation periods were 100 and 100, 92 and 100, 48 and 86, 64 and 66, and 18 and 28, respectively, comparison of the more susceptible varieties being facilitated by the use of a disease index. It will be noted that the Stoneville lines, unlike the other varieties tested, did not contract appreciably more infection after the longer inoculation period, which frequently resulted, however, in the appearance of necrotic spots on 4-8. This may point to the possession of a factor for resistance involving cotyledonary hypersensitivity, which would result in such rapid necrosis of the affected cells as to give the parasite little opportunity of producing the typical lesions. It is thought the method may serve as a rapid supplementary test in breeding disease-resistant varieties.

458. EFFECT OF CORN BARRIERS ON NATURAL CROSSING IN COTTON. By O. A. Pope *et al.* (*J. Agr. Res.*, **68**, 9, 1944, p. 347.) A study was conducted for 2 years on the effectiveness of guard plantings of corn on natural crossing in cotton, in which four conditions of guarding were included: (1) Green-leaf adjacent to red-leaf cotton surrounded by corn; (2) green-leaf separated from red-leaf by three rows of corn; (3) green separated from red by six rows of corn; and (4) green separated from red by nine rows of corn. The amount of natural crossing was determined by planting approximately 1,500 seeds from each row of the plots of green-leaf cotton and determining the percentage of natural hybrids. The data may be interpreted simply and directly, since equal areas were planted to green- and to red-leaf cotton. The results indicate that corn barriers are effective in reducing the amount of natural crossing and that the reduction tends toward linearity for the different barrier widths used in this experiment. Despite the indicated efficiency of barriers in reducing the amount of natural crossing, the results show clearly that the barrier widths of corn used did not afford sufficient protection, under the conditions of this experiment, for the multiplication of selfed-line seed stocks. The minimum amount of natural crossing found would in a few generations of multiplication reduce the homozygosity to a point where the seed stocks would be too badly mixed for continued production. Small-block plantings of red-leaf cotton, made at distances ranging from 700 to 4,200 feet from green-leaf cotton, established the occurrence of natural crossing at distances up to 0·8 mile. It therefore seems clear that distances of 1 mile or more will be required to provide complete isolation, under the conditions prevailing in this study.

459. EFFECT OF THE REMOVAL OF SQUARES ON YIELD OF UPLAND COTTON. By E. W. Dunnam *et al.* (*J. Econ. Ent.*, **36**, 6, 1943, p. 896. From *Exp. Sta. Rec.*, **90**, 6, 1944, p. 802.) Experiments were conducted (1939-41) at Stoneville, Mississippi, to determine the influence on yield of removing at weekly intervals for various periods all squares large enough to attract boll weevils, and of similarly removing given percentages of such squares. Recently developed strains of Upland cotton tend to mature a large proportion of bolls from early-formed squares, and with this in mind an effort was made to obtain information for working out a dusting schedule for boll weevil control adapted to the fruiting habits of the early types of cotton grown in the Mississippi Delta. In these tests, hand removals at weekly intervals for 1 to 9 weeks of all squares over 6 to 7 days old, and at weekly intervals for 7 to 11 weeks of 10 to 50 per cent. of the squares, all resulted in reductions in yield. The

greater square production which followed dusting with calcium arsenate in the absence of an appreciable number of boll weevils was not manifested in increased yields.

460. Low Light Intensity and Cotton Boll Shedding. By A. A. Dunlap. (*Sci. N.S.*, xcviii., **2556**, 1943, p. 568. From *Rev. App. Mycol.*, xxiii., **5**, 1944, p. 176.) Evidence obtained in recent studies at the Texas Agricultural Experiment Station indicates that abnormal shedding of cotton flower buds and immature bolls is often caused by interruption of 2 to 3 days in high sunlight intensities. For instance, Upland cotton plants in jars of soil were subjected, 2 months after planting, to low daylight intensity (roughly equivalent to 50 ft. candles) by placing them in a laboratory room for a single 4-day period. Five weeks later the plants thus treated each bore on an average only 5·4 good-sized bolls, and each had shed 30 buds and young bolls, while the corresponding figures for the controls were 21·2 bolls per plant and 17·5 fruiting forms shed. The low light intensity treatment was thus responsible for a reduction of 75 per cent. in the number of mature bolls. Similar increases in rates of shedding followed the shading of cotton plants in the greenhouse and field with black cloth, which reduced the direct sunlight intensity at midday from the equivalent of 12,000 to between 300 and 1,000 ft. candles.

461. Coloured Cotton Research. (*Cotton*, M/c, 6/5/44.) United States Dept. of Agriculture laboratories have been developing white, brown, and green lint cottons. Brown lint occurs in every known species of cotton, wild or cultivated, the intensity ranging from a very faint cream, as in Pima-Egyptian, to a very dark brown, as in Nankeen, an Upland cotton. Green pigmented cotton occurs only in one species, American Upland. Green lint strains have the highest wax content of all cottons, and there is interest in the possibility of combining, through hybridization and subsequent selection, this wax content with the lint colour and other desirable characteristics of the commercial white strains. The pigment affecting the coloration of several brown-like strains is found in the lumen or protoplasmic debris of the cell, and the colour does not develop until the boll opens. The green pigment occurs in the cell wall; it may be seen soon after the fibres begin to thicken and is apparent by 25 days after flowering. As the fibres develop, the colour is intensified until the boll opens, displaying the bright green pigmentation. On exposure to light the colour gradually fades to a brownish green. It is doubtful if these cottons will ever be grown commercially to supply fibre for making cloth which would not have to be dyed. They are characterized by very low yields and lint percentages. The brown lint cottons are very short and weak, and fabrics made from them are mottled because of the variation in intensity of the pigments. The green-lint fibres are 100 per cent. immature. They have, however, been made into yarn that is as strong as the yarn ordinarily obtained from longer cottons. The instability of the green pigmentation would prevent the commercial use of green fibres as a means of obtaining natural coloured fabrics.

462. Mejoras en la Técnica de Hibridación del Algodon. By L. M. Humphrey and A. V. Tuller. (*Rev. Fac. Nac. Agron.*, **5**, 20, Colombia, 1943. From *Pl. Bre. Abs.*, xiv., **2**, 1944, p. 142.) The method described consists in placing portions of drinking straw, containing the unopened anther of the pollen parent, over the emasculated flower and attaching it with copper wire. No further operation is then necessary till harvest.

463. Variations in the Measurable Characters of Cotton. V. Variations Caused by Change of Place and Season. By R. L. N. Iyengar. (*Ind. J. Agr. Sci.*, August, 1943, p. 434.) Records the variations observed when the same strains of cotton were grown for five seasons at two different stations, Coimbatore and Srivilliputhur. It was found that at Srivilliputhur the fibres were longer, finer, more mature but less in number on the seed than at Coimbatore. The maturation period of the boll and the lengthening and thickening phases of the fibre were less at Srivilliputhur and the rate of length development and that of the secondary wall deposit were higher at that station. The improved length and fineness of the fibres

and the reduction in their numbers per seed at Srivilliputhur appeared to be caused by the higher temperature and solar radiation there.

[*Cf.* Abstracts in Vols. XVI., XIX. and XX. of this Review.]

464. VARIATION IN THE MEASURABLE CHARACTERS OF COTTON FIBRES: A NOTE ON THE VARIATION BETWEEN FIRST AND SECOND FLUSH OF BOLLS. By R. L. N. Iyengar. (*Curr. Sci.*, India, **12**, 10, 1943. From *Exp. Sta. Rec.*, **90**, 5, 1944, p. 604.) The reduction in number of fibres per seed and in the standard fibre weight found in the second crop of bolls is believed due to the higher temperature under which they were produced.

465. RATOONED S×P COTTON. By R. H. Peebles and H. J. Fulton. (*Circ.* 693, U.S. Dpt. Agr., 1944.) Seed cotton samples of ratooned S×P cotton, collected in 1941 from 33 fields in southern Arizona, differ significantly from comparable samples of the annual crop in respect to the means of all the characters measured, and in nearly all characters they show a tendency toward greater variability. The ratooned cotton has smaller, fewer seeded bolls, and smaller, less fuzzy, more abundantly linted seeds. The fibre is slightly stronger and finer, but imperfections are of somewhat more frequent occurrence than in the annual growth. The outstanding advantage of the ratooned product is the higher lint percentage, and the principal disadvantage is the relatively short fibre. Ratooned cotton flowers several weeks earlier than annual plantings, and therefore develops its crop under different conditions in respect to weather and prevalence of destructive insects. Under favourable conditions, ratooned S×P may outyield the annual by a wide margin, as in Maricopa County in 1941, but poor stands and insufficient or improper irrigation sometimes materially curtail the yields. A definite tendency toward stronger correlation of characters is observed in the ratooned cotton. Five coefficients of correlation are significantly larger in the ratooned series, and 18 of the 36 pairs of characters are significantly correlated, as compared with only 12 correlated pairs in the annual samples. The differences noted between the ratooned and annual growths in respect of staple length, lint percentage, and yield must be considered of primary economic importance. On the other hand, the quality of the fibre appears to be very similar in other respects, and it is doubtful whether much practical significance should be attached to the small differences found in such fibre properties as fineness, strength, and frequency of microscopic imperfections.

466. A RAPID METHOD OF SAMPLING FOR FIBRE-WEIGHT DETERMINATION IN COTTON. By V. G. Panse and V. B. Sahasrabudhe. (*Ind. J. Gen. Pl. Brdg.*, **3**, 1943, p. 28. From *Pl. Bre. Abs.*, xiv., **3**, 1944, p. 184.) A rapid method of fibre-weight determination suitable for plant breeders is described. Ten to twelve determinations can be made per hour and a standard error of 4 per cent. of the mean is claimed for the examination of a small number of bunches per plot.

467. DIE BEDEUTUNG DER POLYPLOIDIE FÜR DIE EVOLUTION UND DIE PFLANZENZÜCHTUNG. By W. Rudorf. (*Angew. Bot.*, **25**, 1943, p. 92. From *Pl. Bre. Abs.*, xiv., **2**, 1944, p. 120.) A review of researches on polyploidy is given which shows the diversity that exists among polyploids in their habitats, growth, fertility and economic value. The ever-increasing data on the subject reveal its complexity, not at first suspected. There is a bibliography of 80 titles.

468. POLYPLOID COTTONS OBTAINED BY COLCHICINE. CYTOLOGICAL OBSERVATIONS ON OCTOPLOID *G. hirsutum*. By A. J. T. Mendes. (In Portuguese. *Bragantia*, **2**, São Paulo, 1942, p. 101. From *Pl. Bre. Abs.*, xiv., **3**, 1944, p. 226.) Immersion of delinted seeds in a 0·15 per cent. solution for 16 hours was found to be the most effective treatment. Some plants of *G. hirsutum* failed to react at all, whereas in *G. herbaceum* all plants reacted equally. Most of the roots of the abnormal-looking plants of *G. hirsutum* proved to contain a mixture of tissues with $2n=52$ and $2n=104$; flowers with mixed tetraploid and octoploid tissue were also encountered. At anaphase I in the octoploids 52 chromosomes generally went to each pole, but various deviations were also occasionally observed. Secondary association was of frequent occurrence. Pollen formation was more or less normal, but the anthers mostly failed to dehisce. The pollen was larger and more variable in size than in

normal plants. No seed was obtained either from self-pollination or from cross-pollination with either octoploid or tetraploid. Occasional fruits were formed from open pollination; the seeds obtained, which were usually abnormally large, could often be induced to germinate only by incision of the testa. The plants produced frequently had $2n=52$ chromosomes.

469. USE OF LIQUID CULTURE OF FUSARIUM FOR FIELD INOCULATION OF COTTON. By C. D. Sherbakoff *et al.* (*Phytopathology*, **34**, 2, 1944, p. 254. From *Exp. Sta. Rec.*, **90**, 6, 1944, p. 776.) A liquid culture of *F. vasinfectum* was successfully used for inoculating cotton in the field, by pouring the inoculum into a hole in the centre of a hill. The cost of the culture medium is negligible, and very little time is required to prepare the inoculum and make the inoculations. A test of 23 cotton varieties ranging from highly resistant to very susceptible indicated that the method is a reliable measure of the resistance of cottons to *Fusarium* wilt.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

470. FINENESS OF FIBRES AS MEASURED BY AIR PERMEABILITY AND WEIGHT PER INCH. By M. A. Grimes. (*Text. Res.*, **13**, 1, 1942, p. 12. From *Exp. Sta. Rec.*, **90**, 6, 1944, p. 859.) The method described as to apparatus, procedure, and calculation makes use of the air permeability of a mass of fibres, as indicated by the pressure difference produced in a kerosene manometer by the air passing through a compressed bundle of 250 mg. of the well-mixed fibre sample. The results by the air permeability method are converted to that of weight per inch by the equation weight per inch $=7\cdot8225-(1\cdot4608\times$ the pressure difference). This equation was established from the readings on 36 cottons for which weight-per-inch values had previously been established. In practice, the permeability readings may also be converted to weight per inch by reference to a large-scale regression line or a conversion table. Fineness determinations on four samples of each of five cottons by three methods show close agreement between the surface-per-gram and pressure-difference methods, between weight per inch and pressure difference, and between surface per gram and weight per inch, indicating that the three methods are of approximately equal accuracy. The advantages claimed for the air permeability method are that it requires less expensive equipment, much less time for learning the technique, and less time in making the determinations.

471. COTTON FIBRE: VARIATION OF LENGTH IN BULK AND ON A SINGLE SEED. By R. L. N. Iyengar. (*Ind. Text. J.*, **54**, 1944, p. 197. From *Summ. Curr. Lit.*, xxiv., **12**, 1944, p. 284.) The author took ½ lb. of seed cotton from a bulk sample, selected by a suitable sampling technique 10 seeds, passed each seed through a hand gin and weighed each yield of lint, and then ginned the remainder of the ½ lb. The lint from each individual seed and two tufts of lint from the main supply were then examined by means of the stapling apparatus of Ahmad and Nanjundayya with the attachment for obtaining the fibre length distribution. The test was applied to Sind Sudhar, Jayawant, Surat 1027ALF, and Punjab-American 4F cottons. A table records the weight of lint put through the stapling test, the mean fibre length, the standard deviation and the coefficient of variation (C.V.). The values of C.V. are all in the neighbourhood of 20 per cent. and the values for individual seeds are not really lower than those for the bulk. This suggests that since the variation on a single seed is so large the relatively smaller variations between seeds, bolls, plants, etc., that are added in the bulk samples are without much influence on the total variation.

[Cf. Abstr. 731, Vol. XV. of this Review.]

472. COTTON FIBRE: EFFECTS OF ACETYLATION. By R. Haller. (*Klepzig's Textil-Z.*, **45**, 1942, p. 431. From *Summ. Curr. Lit.*, xxiv., **8**, 1944, p. 175.) Oxidation with hypochlorite has no effect on acetylated cotton or acetate rayon, and no differences in dye deposition were found by saponification of the acetylated fibre. Acetate rayon was not changed by oxidizing agents such as 1 per cent. chromic acid, 30 per cent. Perhydrol (Merck) or permanganate. In cellulose acetates pre-

pared from cotton by neutral catalysts solubility tests in cupri-ethylenediamine and dyeing with Benzopurpurin 4B showed no selective action of the acetylation agent. A selective acetylation of native cellulose could not be established.

473. Bacterially-Decutinized Cotton Fibre: Production. (Chemical Foundation, Inc. U.S.P. 2,336,252. From *Summ. Curr. Lit.*, xxiv., **15**, 1944, p. 369.) The claim is for a new product that readily disperses in cellulose solvents, obtained by subjecting cotton to the action of aerobic cellulose-decomposing bacteria long enough to remove the cuticle without much destruction of the cellulose.

474. Oxidized Cotton Fibre: Stabilization. By R. E. Reeves. (*Ind. Eng. Chem.*, **35**, 1943, p. 1281. From *J. Text. Inst.*, April, 1944, A149.) Damage to cotton fibre on oxidation by periodic acid does not become fully apparent as loss of tensile strength until the oxidized fibre has been exposed to alkalis. Tests with various reagents that might be expected to react with and stabilize dialdehyde groupings against alkali have shown that if oxidation of the fibre is followed by treatment with sodium chlorite solution at *p*H4 or with ethereal diazomethane, the total loss of strength after subsequent exposure to alkali may be greatly decreased. These treatments also reduce the alkali solubility and increase the cuprammonium viscosity of the oxidized fibre. The beneficial action of these reagents is believed to be due to the stabilization of weakened positions within the cotton fibre and not to an actual reversal of degradation. The probability that the action of chlorite on the oxidized fibre comprises selective oxidation of aldehyde groups to carboxyl groups, and the properties of the carboxyl-containing fibres, are briefly discussed.

475. Compressed Cotton: Opening. (*Cotton*, U.S., **108**, 3, 1944, p. 134. From *Summ. Curr. Lit.*, xxiv., **15**, 1944, p. 357.) A correspondent gives particulars, with diagrams of his machinery layout, of methods for opening compressed cotton. *High-density bales* (32 lb. per cu. ft., 15½ cu. ft. per bale) are opened 100 at a time. The cotton is pulled off in strips and fed to a series of five hoppers. It is then carried by a lattice to a vertical opener (at 550 r.p.m.) and to a down-stroke beater (at 400 r.p.m.). The loosened cotton then travels through about 40 ft. of "gyrator" to a press where it is made up again into bales of the standard size but weighing only 350 to 400 lb., and bound by three or four ties only. These loose bales are then treated like the ordinary "flat" or "country" bales (14 lb. per cu. ft.; 45 cu. ft. per bale), but are first stored for at least 24 hours, which is claimed to increase production at the card by about 4 lb. per hour. (The cotton used by the mill is $1\frac{3}{32}$ inches Strict Middling or better.) *Standard compressed bales* (22 lb. per cu. ft.; 22½ cu. ft. per bale) are opened 40 at a time. Four bale breakers feed the cotton via a conveyor belt, gyrator and three hoppers to three Aldrich beaters (1,000 r.p.m.) and vertical openers (550 r.p.m.), and thence through trunks to the scutcher hoppers. When these hoppers get full, the hoppers before the beaters stop, and when these fill up the bale breakers stop. (The standard compressed cotton used in this mill is Western 1 inch staple, and Strict Low Bright in grade.)

476. Rubber and Petroleum: Deposition on Cotton. By S. S. Voyutskii and E. M. Dzyadel. (*Prom. Lubyanykh Volokon*, **11-12**, 1940, p. 26. From *Summ. Curr. Lit.*, xxiv., **8**, 1944, p. 176.) On cotton fibres aqueous suspensions of rubber and emulsions of paraffin or liquid petrolatum are irreversibly sorbed (the emulsion of paraffin most, and liquid petrolatum least). The velocity of sorption and the bond between the hydrophobing agent and the fibre are greatest with rubber. A preliminary treatment with hydrochloric acid and aluminium sulphate increased the amount of the rubber and of paraffin sorbed and deposited on the fibre.

477. Cotton Linters: Production and Application. By E. L. Day. (*U.S. Dpt. Agr., Agr. Econ. Bibl.*, **88**, 1940. From *Summ. Curr. Lit.*, xxiv., **9**, 1944, p. 191.) Brief abstracts are given of 205 papers published between 1900 and 1940, classified under (1) General, (2) Methods of recovery, (3) Quality, (4) Commerce, (5) Uses, and (6) Legislation, regulation and adjudication. An index is provided.

478. Cotton Bales: Sampling. By R. W. Mitchem. (*Text. World*, **94**, 3, 1944, p. 89. From *Summ. Curr. Lit.*, xxiv., **12**, 1944, p. 271.) Draws attention (with

illustrations) to the dilapidation of cotton bales and consequent loss due to cutting the cover for taking a sample. The bill for new bagging in the United States is nearly $10,000,000 annually, though jute or cotton covers should last 25 to 35 seasons if stored in dry places and not cut. The writer suggests that a licensed grader and cotton classer should be attached to each ginnery to see that a duplicate sample of the cotton of, say, 7 lb. is fastened under the middle bale ties in a waterproof paper envelope. Sub-samples could be withdrawn but not replaced, and the bale cover would be preserved.

479. THE COMPLETE MODERN COTTON SPINNING MILL. By J. Buckley. (*Text. Mnfr.*, March, 1944, p. 113.) Makes suggestions for three typical modern layouts.

480. WORKING CONDITIONS IN COTTON SPINNING MILLS. By A. C. C. Robertson and A. Roberts. (*Text. Mnfr.*, March, 1944, p. 98.) Some useful detail and general mill arrangements, from the operatives' standpoint, are suggested. The subjects dealt with include the dust problem, staffing and spacing, and labour shortage and mill conditions.

481. TEXTILE FIBRES: MICROBIOLOGY. By W. S. Marsh. (*Amer. Dyes. Rpt.*, **31**, 1942, p. 563. From *Summ. Curr. Lit.*, xxiv., **15**, 1944, p. 364.) A report is given of a discussion of bacteria and fungi occurring on textile materials and their effect on the textile materials, the numbers of organisms per sq. in. commonly found on cotton, wool, and silk, the use of ultra-violet radiation for the control of air-borne organisms, the treatment of textile materials with germicides and fungicides, and the effects of synthetic resins, formaldehyde, salts of heavy metals, and other compounds on the growth of micro-organisms.

482. MILDEW IN COTTON. I. THE ROUTINE EXAMINATION OF TEXTILE ANTISEPTICS. II. ESTIMATION OF SALICYLANILIDE IN TEXTILES. III. SYNTHETICAL EXPERIMENTS IN ANTISEPTICS FOR TEXTILES. DERIVATIVES OF CASHEW-NUT SHELL OIL. By R. C. Gandhi and K. Venkataraman. (*J. Ind. Chem. Soc.*, Indus. and News Edn., v., 1942, p. 75. From *Rev. App. Mycol.*, xxii., **9**, 1943, p. 322.) The action of antiseptics on cultures of *Aspergillus niger* was investigated by the method of Fargher *et al.*, and the most promising compounds evaluated in a second test, in which cotton cloth treated with the various preparations was inoculated with the mould and placed in a moist atmosphere over mildewed water. The most active fungicides were para-chlorophenol, α- and β-naphthol, and salicylanilide and its derivatives. The amount of the preservative shirlan (salicylanilide) present on a fabric can be estimated by a method based on the fact that the antiseptic will absorb approximately 3 mols. of bromide per mol. None of the derivatives of cashew-nut shell oil tested proved superior as mildew-preventives to those mentioned above.

TRADE, PRICES, NEW USES, ETC.

483. WORLD COTTON CROP: PRODUCTION, 1943-44. (*Text. Wkly.*, **33**, 1944, p. 666. From *Summ. Curr. Lit.*, xxiv., **12**, 1944, p. 271.) The output of cotton in the past three seasons, and forecasts for 1943-44, are tabulated for each country producing more than 25,000 bales, and for the 35 other countries in which small crops are grown. The crop for the current season is expected to reach 26 million bales.

484. COTTON: USE IN CONCRETE. By C. R. Platzmann. (*Oel u. Kohle*, **38**, 1942, p. 1193. From *Summ. Curr. Lit.*, xxiv., **15**, 1944, p. 367.) Addition of 2 per cent. of cotton or asbestos fibre to concrete reduces its permeability to water. Plaster of Paris or calcium chloride is used to reduce the setting time of concrete.

485. COTTON INSULATION. (*Cotton*, M/c, 12/8/44.) The Research Division of the U.S. National Cotton Council reports that an insulating layer of cotton, blown into the side walls and attic of a Dallas, Texas, home three and a half years ago is still in perfect condition and has given highly satisfactory performance. A total of 741 lb. of fireproofed cotton was used, filling an insulating area of approximately 2,500 square feet. A recent inspection revealed the cotton had not settled, and that it retained all of its fire-resistant properties. There was no evidence of moisture accumulation, dampness, rot or mildew either in the attic or in the side walls. There was also no evidence of infestation by mice or other vermin.

486. COTTON FABRICS: USE IN LAMINATED PLASTICS. (*Text. Res.*, **14**, 1, 1944, p. 11. From *Summ. Curr. Lit.*, xxiv., **9**, 1944, p. 205.) A discussion of the use of cotton fabrics in the production of laminated plastics, the advantages and disadvantages of cotton fabrics compared with other materials, such as paper and fiberglas fabrics, for this purpose, and the need for the development of new fabric constructions especially suited to specific needs, and for investigations of factors governing fabric strength and their relationship with the strength obtained from a fabric when used as a filler in a laminated plastic.

MISCELLANEOUS.

487. BRITISH COTTON INDUSTRY: PLANNING. (*Times Tr. and Eng.*, **54**, 1944, p. 42. From *Summ. Curr. Lit.*, xxiv., **10**, 1944, p. 242.) The special committee appointed by the Cotton Board for dealing with post-war problems has asked the Government for an assurance that the appointment of a post-war Cotton Board will be made before the present Cotton Control is abolished. The certainty of a serious shortage of operatives in the industry after the war has directed special attention to the urgency of carrying out reforms which will make work in the mills more attractive. A committee of recruitment and training has already been appointed and a special department of the Cotton Board set up to administer the plans and policy of the committee. The intention is not only to ensure regular and interesting work at good wages, but also to offer good prospects of promotion to ambitious juveniles. The most recent development is the institution of a training scheme for foremanship and other mill executive positions, and over 1,300 enrolments have been made for a course of 12 lectures. The total general wage advances for workers in the manufacturing section since the outbreak of war amount to 35 per cent. for cost of living, plus 9s. a week flat increase. It is expected that joint meetings will be held in the near future to discuss a starting-point system of wages for weavers. The subcommittee appointed by the Cotton Spinners' and Manufacturers' Association to investigate methods of wage payments and conditions of work in the weaving section has suggested a number of improvements which are likely to lead to higher efficiency and better relationships between employers and workpeople. A good response has recently been made to the request of the Cotton Controller for a resumption of overtime working in spinning mills.

488. STRUCTURE OF THE COTTON INDUSTRY. (*Text. Mnfr.*, April, 1944, p. 147.) Discusses the diversity of size and type amongst British textile firms. The predominantly "horizontal" specialization of the industry is unusual and suggests new possibilities of vertical co-operation or integration.

489. RESEARCH WORKERS: EDUCATION AND PLACE IN INDUSTRY. By A. P. M. Fleming. (*Engineer*, **177**, 1944, p. 234. From *Summ. Curr. Lit.*, xxiv., **8**, 1944, p. 189.) A report of an address to the Manchester Chamber of Commerce. Research workers are divided into two broad types: (1) those engaged in the pursuit of knowledge for its own sake—the workers in pure or fundamental science; and (2) those engaged in applying the new discoveries to useful purposes—the applied or industrial research workers. The functions and education of both types are discussed, and it is pointed out that, whereas it is not essential for the researcher in pure science to have industrial experience, such experience is necessary for the industrial research worker. In the chemical industry the best plan may be to continue for a few years a post-graduate course in an advanced field of chemistry, and then to enter a laboratory in the chemical industry. It may be preferable for an engineer to leave the university on graduation and spend the next year or two as an apprentice in an engineering firm possessing a research organization. After acquiring a knowledge of works organization and problems he would proceed to the research laboratory. Such a plan is practicable only in the large organizations with established research facilities, and in the national interests large industrial concerns should be willing to train research workers for their entire industry. An alternative would be to use the facilities of the Research Associations on the lines of the plan developed by the

British Cotton Industry Research Association. The industrial research worker should be trained to sell his abilities and to give service in such a tactful way that his help is welcomed and not resented. The large concern with its own research organization is able to bring quickly to bear on its problems all new relevant scientific knowledge, but the small concern is at a disadvantage and manufacturing firms in this country are mostly small. The solution would be for each small company to have at least one technically trained officer able to translate and make effective all the appropriate new knowledge provided—*e.g.*, by the Research Association of the industry concerned. Comparisons with the United States and Soviet Russia indicate that in this country the quality of research is satisfactory, but the number of research workers is far too small. In the future, to an increasing extent, industrial problems will be undertaken by mass attack, and numbers will play an important part. Our disadvantage in this respect could be minimized by encouraging a scientific attitude of mind throughout industry and ensuring that technicians and artisans adopt that attitude of mind and mobility and skill which will enable them to turn new developments to account quickly.

490. Industrial Research: Wider Aspects. By J. W. Waterer. (*Times Tr. and Eng.*, **54**, 959, 1944, p. 9. From *J. Text. Inst.*, March, 1944, A135.) The author suggests that what British industry needs, perhaps even more vitally at the moment than a great increase in scientific research, is a body of trained specialists, one of whose tasks is to think out the implication of each new invention, unhampered by tradition based on materials and methods of other days, and to achieve the greatest measure of intelligent development of finished products. With such an approach each new discovery or invention can be made to serve the needs of mankind with complete fitness for purpose. Another and equally important function of the specialist or industrial designer is to ensure that in every product of the factory perfect function, which is not so difficult to achieve, is allied to beauty of form, which is not so simple a matter. As a result of industrialization of countries hitherto regarded by British manufacturers as good markets, these markets will no longer be open for the commonplace or mediocre, which they will produce themselves, and trade with them will depend on goods of better quality combining mechanical efficiency with good design. No adequate training facilities have yet been provided for the industrial designer. To a large extent design research can be undertaken by a central trade unit analogous to that of the Cotton Board's colour, design and style centre, and the research department of the International Wool Secretariat. A third and equally vital attribute of progressive development is market research. This is primarily the function of a trade organization, and the machinery of the export groups would appear to be ideally suited to its promotion. It should include a detailed study of each market and of right methods of selling, presentation, packaging, advertising, shipping, etc. All such development schemes should be regarded as educational in character. Their success or failure depends upon the use which private enterprise makes of them.

491. Scientific Research: Organization in Great Britain. (1) *Nature*, **153**, 1944, p. 539. (2) *Parl. Debates* (Hansard), vol. 399, No. 62, 19/4/44. From *J. Text. Inst.*, July, 1944, A332.) A report is given of a recent debate in the House of Commons. The debate revealed a growing recognition of the importance of improving the remuneration, status and conditions of service of the research worker. Tributes were paid to the achievements of research workers in Great Britain and the importance of quality in such workers was emphasized. It was agreed that fundamental research, on which progress ultimately depends, must be the task of the universities, and that there must be much greater expenditure both on fundamental research and on teaching at the universities. It was recommended that industrial research should be directed to the industrial processes which exist in Great Britain, to the discovery of new industries, and especially to the utilization of raw materials which exist at home and in the Colonial Empire. The expansion of research in such fields as animal diseases and nutrition, food and nutrition, soil fertility, and biology, including fisheries, was repeatedly urged. It was suggested

that the machinery for giving grants to the universities should be brought more directly under the Office of the Lord President of the Council, who already has the Department of Scientific and Industrial Research under his wing. Other suggestions were that an advisory council for the universities should be formed for the interchange of experience and the prevention of overlapping, that fundamental research should be organized by some sort of parliament of science, and that the Scientific Advisory Committee should be asked to prepare a plan for the development and carrying on of scientific research for a 10-year period. The need for more workers with scientific training in industry, a rapid development of scientific and technical education, closer contact between those engaged in scientific research and those concerned with its practical application, and the discovery of further means of assisting the development and the practical evolution of new industrial ideas was pointed out. Reference was made to the Mellon Institute and its system of industrial fellowships. It was stated that the Government recognizes the need for the establishment of some fund to meet the cost of developing new inventions and of providing facilities for testing new ideas for industry. The best way to meet this need and to fit it in with the work of the research associations is now under examination, but Government support for research must be backed by a readiness to use the results of that research, and the main responsibility for applied research must continue to fall on industry itself.

ADDENDA.

492. UGANDA: COTTON PROSPECTS, 1944-45. The report of the Dept. of Agriculture for July states that weather conditions were not favourable to planting in most areas until the second half of the month, when substantial acreages were sown. The demand for seed continued brisk. There will be a higher proportion of late sown cotton in Buganda and Busoga owing to dry weather in June and the first half of July. Crop condition is normal for the time of year and little damage has been caused by pests and diseases.

493. NOTE ON THE "FRENCH" OR "SMALL-SEEDED" COTTON GROWN IN THE WEST INDIES IN THE EIGHTEENTH CENTURY. By J. B. Hutchinson and S. G. Stephens. (*Trop. Agr.*, July, 1944, p. 123.) The most comprehensive classification of cottons grown in the West Indies in the eighteenth century is that given by Edwards in 1793 ("History of the West Indies"). He divides them arbitrarily on the basis of seed characters into two main groups: (1) Green-seeded, in which the delinted seed has a downy covering of fuzz hairs, and (2) Shrub cottons (black-seeded type), in which the delinted seeds are naked except for a tuft of brown or whitish hairs (sometimes absent) around the beak of the seed. Recent investigations leave little doubt that the green-seeded type was an agricultural race—*i.e.*, "agrotype" of Marie-galante (Gregor, *Ann. Appl. Biol.*, **20**, 1933). Borde, in the "Histoire de l'Ile de la Trinidad," 1876, describes the cottons of Trinidad in the mid-nineteenth century as being "tree-like and of the green-seeded variety, with long and fine lint, cultivated principally on estates around the Gulf and in the Bocas." Since the cotton population of this area to-day consists almost exclusively of Marie-galante types which all have green or greenish-brown fuzzy seeds, there can be no question of the identity of the formerly cultivated types. The identification of the Shrub cottons is more difficult. Edwards subdivided them into Common Jamaica, Brown Bearded, French or Small-seeded, and Kidney or Chain Cotton. Evidence has already been advanced by Stephens (*Trop. Agr.*, **21**, 1944) which leads to the conclusion that the Common Jamaica and the Kidney cottons belonged to *G. barbadense* and its variety *brasiliense* respectively, while the Brown Bearded was almost certainly a Marie-galante type. Edwards described the French or Small-seeded type as being the cotton cultivated in Hispaniola and later introduced into the British Islands. It had small seeds with a whitish tuft and lint of greatly superior quality, but was less hardy than the other cottons grown. Marie-galante cottons as a whole have much smaller seeds than *barbadense*, and the question arises as to

whether the French cotton was merely a fine linted selection of Marie-galante. The *barbadense* perennial cottons in the West Indies to-day are certainly coarse-linted in comparison with the Marie-galante types, but it is difficult to rule out *barbadense* entirely without independent evidence, particularly since there was an old but unconfirmed belief that the ancestors of the present high quality annual Sea Island cottons (*G. barbadense*) were introduced into the Southern States from the West Indies. An obvious source of independent evidence worth investigation was to sample the perennial cotton population of those islands which were under French Government when cotton growing in the West Indies reached its maximum development, and which also had a reputation for good quality cotton. In this connection two West Indian islands are of great interest: Hispaniola (Haiti and San Domingo) and Tobago. According to Edwards the cotton of the former in 1780 had a finer staple than that of other cottons grown, and he also states that it was the " French " type which was cultivated. At that time the western part of the island, Haiti, was one of the most valuable French possessions owing to its great agricultural fertility, and it is likely that cottons grown successfully there would have been introduced into the other French, or formerly French, islands, particularly those in which cotton was an important crop—*e.g.*, the Grenadines and Virgin Islands. Edwards stated that the cotton grown in Tobago in 1780, when it was a British possession, was of inferior quality, but in 1781 the island came into the hands of the French and remained under their control until 1793. This period of French ownership happened to coincide with the boom in cotton growing which followed the development of spinning machinery in Europe, and the destruction of cane plantations in the West Indies by the sugar ant. As a consequence cotton became the premier crop of the island under French rule, and in 1792 " the finest cotton ever brought to the English market " was grown on the Robley estate (Golden Grove) in Tobago. The most likely explanation of this remarkable improvement in quality during the short period of French ownership is that a superior strain of cotton had been introduced by the French, since it is known that lint characters are comparatively little affected by changes in soil fertility such as would have accompanied a general improvement in agricultural practice. Collections recently made in Tobago have demonstrated that a superior strain of Marie-galante cotton with characters agreeing with Edwards' description of " French or Small-seeded " cotton is still in existence in the island. No collections have so far been obtained from Haiti, but certain conclusions can be drawn from published descriptions available. From Cook's botanical description and photograph (*J. Hered.*, **14**, 1923) it is evident that the Haitian cotton belongs to the Marie-galante variety. The cotton is described as a large perennial bushy plant often growing to a height of 8 or 10 ft. It has small, slightly fuzzy seeds with a staple from 1 to 1¼ in. Subsequently selection work was carried out on the native crop, particularly for lint length and yield, and in 1934-35 types with lint length of 39·6 mm. had been obtained. These brief records indicate that the distribution of the plant is quite in accordance with its distribution in other islands, and also that by straightforward selection in the general crop population high quality strains can be isolated which equal in lint length the high quality types found in the Grenadines and Tobago. The " slightly fuzzy seeds " as far as may be judged from Cook's description resemble the semi-fuzzy types found in Tobago. There is reason to believe that semi-fuzzies are extreme variants of true tufted and distinct from fuzzy types, this conclusion being based on the results of unpublished breeding experiments carried out at the Cotton Research Station, Trinidad, with fuzzy × tufted crosses. Subject to confirmation by examination of samples of Haitian cotton, the conclusion therefore seems justified that the " non-fuzzy " Marie-galante cottons of Haiti, the Grenadines, Virgin Islands, and Tobago represent the relics of the French or Small-seeded cotton which was so esteemed in the eighteenth century.

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THE OCCURRENCE OF PLATYEDRA GOSSYPIELLA, SAUND., IN NIGERIA

BY

F. D. GOLDING, M.A., F.R.E.S.

[In view of its interest and the current importance of the information it contains, the following brief original article is published in full.—ED.]

THE object of the present note is to record the presence of the pink bollworm in Nigeria. In late July, 1944, two adults were bred from resting larvæ in cottonseed stored at Soba, near Zaria. A survey of stored cottonseed and cotton in the field in the Zaria and Sokoto Provinces carried out in November and early December, 1944, gave negative results; but in January, 1945, one larva was received from a boll at Samaru, near Zaria. It is evident that *Platyedra* is at present rare in the American cotton belt of the Northern Provinces. On the other hand, it has recently been found to be widely distributed in the Native cotton (*barbadense* and *peruvianum*) area in the Oyo and Abeokuta Provinces and has apparently been present for several years. Evidence has been obtained that the larval resting stage occurs at Ibadan. Harvested seed cotton was examined during January and was found to contain many short-cycle larvæ; there was no sign of resting larvæ. Cottonseed ginned in late February was found to contain resting larvæ, and this stage was also present in March in bolls on native farms. There was a ten-day period of "harmattan" in February, and it is probable that the factors responsible for the initiation of the resting stage were the atmospheric aridity concomitant with this north-easterly wind and the high temperatures characteristic of February.

During the years 1923 to 1930 detailed surveys of the factors inhibiting the growth and development of the cotton plant were carried out in the following localities: Ibadan, Oyo, Adio, Ilugun, Ilorin, Bode Sadu, Yandev and Bida; *Platyedra* was not then present. During the 1938-39 season a survey was made at Bomo, near Zaria; in early 1938 a

study was made of the "over-wintering" of cotton pests near Zaria; brief studies of the bollworm population of cotton at Kano, Sokoto and Zaria were made in June, August and October, 1939. No pink bollworms were found.

A number of authors of papers of a general nature on cotton pests have stated that the pink bollworm was present in West Africa, *e.g.*, Johnson (2, 1926) and Williams (4, 1933). The first author's statement was based on a paper by Sasscher (3, 1917) in which the following account appears: "It is of peculiar interest to note that the prize ship *Appam*, which was brought into Hampton Roads early in the year, contained as a part of its cargo some two hundred tons of cotton seed from Lagos, West Africa, a region known to harbour the pink bollworm. Although no living larvæ of the pink bollworm were located it was apparent, from the condition of the material, that about 2 per cent. of the seed had at one time been infested with this insect." As stated in an earlier paper (1, 1927), the writer considers that this record is unreliable; it is highly probable that the seed had been attacked by *Argyroploce leucotreta*, Meyr., or by *Pyroderces* sp.

Vayssière and Mimeur (5, 1926) expressed their conviction that *Platyedra* was not present in French West Africa at the time they wrote their comprehensive treatise on the cotton pests of that region. In May, 1944, the writer was told by M. Risbec that the pink bollworm had recently been found in the Bamako district of the Sudan and in a district of the Ivory Coast. Subsequently, M. Alibert informed him that *Platyedra* had been found in Dahomey; he considered that it had been present in French West Africa for some considerable time, but had not been noticed. The larval resting stage occurs in the Sudan, but has not yet been observed in the Ivory Coast.

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ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

1. India: Cotton Industry, 1943-45. A report recently received from the Indian Trade Commissioner stated that in the 1943-44 season the consumption of raw cotton by Indian mills fell short of the record established in 1942-43 by nearly 200,000 bales; this was chiefly due to the shortage of labour and coal in certain areas.

The acreage planted to cotton in 1944-45 was estimated at about 23 per cent. less compared with that of the previous season. This was due to the "grow more food" campaign, unfavourable seasonal conditions, and the comparatively lower prices for cotton in relation to food crops.

There has been a gradual reduction in yield per acre during the war owing to the shortage of fertilizers, but greater production per acre is predicted when the increased use of fertilizers is possible, and by the employment of modern methods of farming.

2. Indian Cotton: Review of the 1943-44 Season. We have received from Messrs. Chunilal Mehta and Co., Bombay, a copy of the *Indian Cotton Review* for the 1943-44 season. This is the seventeenth issue of the *Review*, and contains much useful information in connection with the Indian cotton industry. The area under cotton totalled 20,398,000 acres and production amounted to 5,094,000 bales, compared with 19,203,000 acres and 4,702,000 bales in 1942-43. Yield per acre was 100 lb. in 1943-44 compared with 98 lb. in the previous season. Imports of foreign cottons showed a decrease of approximately 27 per cent. in Egyptians and an increase of 120 per cent. and 40 per cent. respectively in Sudan and East African cottons. Consumption of Indian raw cotton by Indian mills reached 4,125,000 bales, compared with the record of 4,307,000 bales in 1942-43. Exports of Indian raw cotton amounted to 1,051,000 bales compared with 904,000 bales in the previous season. An interesting section of the *Review*, under the title of "Looking Ahead," deals with the prospective position of Indian cotton during the 1944-45 season. The various statistical tables included in the report are concerned with cotton acreage and yield in India; world supply, distribution, and stocks of Indian cotton; consumption of Indian cotton by mills in India; cotton prices in Bombay, etc.

3. Report on the Staple Length of the Indian Cotton Crop of the 1943-44 Season. (*Stat. Leaflt. No.* 1, 1944. Ind. Cent. Cott. Comm.) The crop of the 1943-44 season is estimated by the Government to produce in bales of 400 lb.:

Long staple, over 1 inch	363,000
Medium staple, $\frac{7}{8}$ to 1 inch	2,797,000
Short staple, below $\frac{7}{8}$ inch	1,934,000
Grand total	5,094,000

4. Indian "Cotton Textiles Fund Ordinance," 1944. (*Ind. Text. J.*, **54**, 1944, p. 425. From *Summ. Curr. Lit.*, xxiv., **23**, 1944, p. 583.) The text is given of an Ordinance set up "to establish a fund for supervising the exports of cotton cloth and yarn, and for the development of technical education, research and other matters" in relation to the cotton textile industry of India. It is proposed to levy a duty of 3 per cent. of the price, ex-factory, on cloth and yarn manufactured in India and exported.

5. Indian Textile Industry: Post-War Development. (1) B. B. Joshi. (2) J. A. Sutton. (3) P. N. Joshi. (*Ind. Text. J.*, **54**, 1944, p. 397. From *Summ. Curr. Lit.*, xxv., **5**, 1945, p. 130.) Reports are given of papers read at an All-India Textile Conference, Bombay. (1) B. B. Joshi traces the trend towards higher counts and finer fabrics in Indian spinning and weaving, and emphasizes the paramount need for new machinery after the war. The possibility of establishing a textile machinery industry in India is discussed. A strong plea is entered for wider technical education

and co-ordination with organized research. The creation of an Indian Cotton Textile Industry Research Association is suggested. (2) J. A. Sutton reports on experiences gained in the production and testing of textiles for the Services. (3) P. N. Joshi's address is concerned with the better organization in India of textile education and research.

6. A Manual on the Preparation of All-India Cotton Crop Forecasts. (Ind. Cent. Cott. Comm., 1944. Price: 8 annas.) An account of the procedure followed in the preparation of the official cotton forecasts in India. Three appendices are included: I. The method of framing estimates of crops; II. Methods of collecting the statistics province by province; III. The normal outturn of crop in the different provinces in terms of "anna" notation.

7. Manuring of Cotton in India. By V. G. Panse. (*Ind. Frmg.*, March, 1944, p. 131.) A brief account is given of an examination of all available results of cotton manurial trials carried out in different provinces in India. Nitrogen, phosphate and potash are the three chief plant food elements supplied through the manures either singly or in combination to the plant. Of these, nitrogen was found essential for increasing the yield of cotton under both dry and irrigated conditions. Potash was without value in all areas. Phosphate showed no beneficial effect on yield over any large tract, but there are certain patches of soil where cotton responds to phosphate manuring, and further trials should be directed towards marking out areas where the nitrogenous manuring of cotton might be profitably augmented by the addition of phosphate. To the general increase in yield brought about by nitrogen the following two exceptions were observed: (1) In the irrigated tract, presence of soil salinity prevents the crop from responding to the fertilizer; (2) In rainfall areas manuring is not effective where rainfall is low. Artificial fertilizers and other nitrogenous manures available from local sources are compared, conditions in which manuring will pay are discussed, and the need for further trials is stressed.

8. Cotton Pests in Burma and the Punjab. See Abs. 153.

9. Pre-Cleaning and Ginning Tests on Indian Cottons. By N. Ahmad. (*Tech. Leaflts. Nos.* 7 and 8. Ind. Cent. Cott. Comm., 1944.) *Leaflet No.* 7.—The need is stressed for care, coupled with scientific knowledge, to be exercised in the ginning process if the best results are to be obtained in maintaining the quality of Indian cotton at a satisfactory level. If the seed cotton is not presented to the machines in good condition, *e.g.*, if it is wet or matted, the ginning is not efficient and the quality of the lint suffers accordingly. The Technological Laboratory of the Indian Central Cotton Committee is equipped with three types of pre-cleaning machines and three types of gins, and these are briefly described. Tests are being carried out on a number of Indian seed cottons using different pre-cleaning machines and their combinations with different saw speeds and rates of feed in the saw gin, and different overlap settings and roller speeds in the roller gins. The results will be published in leaflets of this series.

Leaflet No. 8.—Gives the result of pre-cleaning and ginning tests carried out on Surat 1027ALF cotton of the 1940-41 season.

10. Spinning Test Reports on Indian Cottons, 1929-44. By N. Ahmad. (*Tech. Circs.*, Nos. 584-588, 590-604, 606. Ind. Cent. Cott. Comm.) The circulars contain the grader's report and spinning test results for carded and combed samples of 289F (saw-ginned) and A. R. Kampala, Bailhongal Jayawant and A. R. Kampala, Surat 1027ALF and A. R. Kampala, 1941-43 seasons; Sind M.4 (saw-ginned) and A. R. Kampala, 1942-43 season; Punjab-American 4F, 1929-44 seasons; Bijapur, 1933-44 seasons; Bailhongal, C.P. No. 1, Miraj, 1935-44 seasons; Navsari, 1936-44 seasons; Cambodia, Karunganni, Verum, 1940-44 seasons; Hubli Jayawant, Surat, 1941-44 seasons; Bagalkote Jayawant, Bailhongal, Broach B.D. 8, P.A. 4F (Bahawalpur), Westerns, Viramgam, 1943-44 season.

11. Indian Textile Mills. By J. H. Strong. (*Text. Merc. and Argus*, 111, 1944, p. 501. From *Summ. Curr. Lit.*, xxiv., **23**, 1944, p. 556.) A report of a lecture describing recent experiences in Indian mills, the types of cloth produced, and the great strides of the Indian manufacturing industry during the present century.

12. Bombay Cotton Wages, 1914-19 and 1939-43. (*Ind. Text. J.*, **54**, 1944, p. 356. From *J. Text. Inst.*, December, 1944, A543.) Available statistics are analysed in a comparison of cost of living and wage trends during the two World War periods. In both periods the great rise in costs occurred in the fourth year, but the operative is in a much better position now than in 1919, because wages and bonuses have not lagged so far behind. There have been much greater rises in the index for costs and wages in India than in England since 1942.

13. Co-operative Movement, 1943-44. (*Ind. Text. J.*, August, 1944, p. 444.) The Bombay Co-operative Marketing Society suffered heavy loss owing to unauthorized credits being given to certain parties. Steps were therefore taken to overhaul its working, and it is satisfactory to note that in a few months after the close of the co-operative year it had made up its losses. The cotton sale societies in Gujerat and Karnatak continued to play an important part in the co-operative marketing of cotton. In East Khandesh, under the scheme for multiplication of Jarilla seed and marketing of Jarilla lint on the Surat model, seven more cotton sale societies were registered during the year. The eight societies previously registered distributed pedigree seed worth about Rs. 50,000, and their total sales of ginned cotton during the year amounted to nearly Rs. 2½ lakhs. Amongst other agricultural non-credit societies, the Taluka Development Associations, numbering in all 113, in addition to their activities in the direction of propaganda for the adoption of improved methods of agriculture and the use of improved agricultural implements, did considerable work in intensifying the " Grow-more-food " campaign.

14. Jarila Cotton, 1943-44. (*Ind. Frmg.*, July, 1944, p. 325.) About 800,000 acres were sown to cotton in Khandesh during the season, 95 per cent. of the area being under Jarila. Unusually heavy rains in October damaged the crop, but the Jarila variety suffered less from the adverse conditions than the *desi* cotton.

15. Surat Weaving Industry: Organization. By M. C. Munshi. (*Ind. Text. J.*, **54**, 1944, p. 352. From *J. Text. Inst.*, December, 1944, A543.) A brief history is given of the weaving industry of Surat from the early sixteenth century. In 1682 the export of cotton fabrics was 1,436,000 pieces. A characteristic feature in modern times is the large number of small establishments with about 3-5 power looms each. In 1942-43 a survey of 649 such places accounted for 4,108 looms, of which 3,645 were power looms, including many by Hattersley. The author discusses the reactions of this kind of establishment both on the handloom industry and on the large mills.

16. American Cottons in the Deccan. (*Ind. Frmg.*, July, 1943, p. 364.) Sugar-cane occupies a pre-eminent place in the canal tracts in the Deccan, but cotton is an important element in the rotational system with cane. The usual practice is to grow cotton on cane ridges after the harvest of the latter crop. Barilla and Jarila are the main varieties cultivated. From the standpoint of irrigational facilities and the residual advantage of heavy nitrogenous top dressings applied to sugar-cane, the cultivation of long-stapled American cottons is considered of importance. Experiments have been carried out with thirty promising varieties obtained from Sind, the Punjab, and Madras, and of these fifteen have been retained for further trials which are now in progress. All the American varieties are susceptible to what is known as " red leaf blight." This disease appears late in June, mostly on cloudy days, and reaches its maximum at the end of July. It first attacks the lower surface and then spreads throughout the leaf, and in its intense form appears on the bolls. Eventually the leaves shrivel up and drop and the bolls open badly. Experiments are in progress in connection with sowing dates, mixed cropping, and manuring, in order to mitigate the harmful effects of the disease.

17. Hyderabad: Handloom-Weaving Industry. (*Ind. Text. J.*, August, 1944, p. 435.) Benares hand-woven cloth to the value of Rs. 25-30 lakhs is imported into the Nizam's Dominions every year, and it is considered that if this type of cloth were manufactured locally it would ensure employment and better living conditions for some 250 families, besides setting up a profitable industry. With a view to stimulating improvement in the handloom weaving industry generally so that it may be able to hold its own against machine-made goods, a scheme has been sanctioned

by the Department of Technical and Vocational Education whereby a Benares cloth weaving expert will be employed for three years to supervise the weaving section of the Government Central School of Arts and Crafts, and to train ten selected candidates in this special craft. All these candidates will be given scholarships of Rs. 15 per-mensem during their three years' training, at the end of which period it is considered that they will have gained sufficient knowledge to work for the further development of the industry.

18. Indore Institute of Plant Industry: Progress Report of the Cotton Genetics Research Scheme, 1943-44. See Abstract 201.

19. Madras: Coconadas Cotton. (*Ind. Frmg.*, February, 1944, p. 80.) Coconadas cotton is grown over an area of some 108,200 acres in the Madras Province in the districts of Vizagapatam, Godaveri, Kistna, Guntur, and Nellore. It possesses a mean fibre length of $\frac{5}{8}$ to $\frac{3}{4}$ in. and a ginning percentage of 25. The lint has a natural tint varying from drab to reddish brown, and is largely utilized in the manufacture of dyed yarns. It is preferred to white cottons on account of its capacity to absorb dye readily. In recent times, however, there have been some complaints about a general deterioration in its quality due to the admixture of inferior white cotton grown in parts of Guntur, Nellore, and Vizagapatam. The main drawbacks of Coconadas cotton as at present cultivated are its variable colour, short staple, low ginning outturn, and indifferent yield, and the Indian Central Cotton Committee is financing a scheme to remedy these defects if possible, while preserving at the same time the light pinkish colour of the lint for which this cotton is in great demand. As the variety is cultivated on both black and red soils, the work is being carried out at two centres, Gurazala for the black soils, and at Narasaraopet for the red and the light black soils.

20. Cotton, Silk, and Lace: Handloom Weaving. By V. G. Ramakrishna Iyer. (*Ind. Text. J.*, **54**, 1944, p. 455. From *Summ. Curr. Lit.*, xxv., **3**, 1945, p. 51.) Describes the practices followed by the handloom weavers of the Tanjore District, South India, with brief particulars of the dhoties, towels, lace cloths, mixed cotton and silk fabrics, etc., produced by them, and the costs for materials and labour.

21. Punjab: Cotton Improvement. By C. K. Ratul. (*Ind. Frmg.*, February, 1944, p. 84.) In the work carried out by the Cotton Research Section, Lyallpur, for the improvement of Punjab-American cottons, reselection of 289F/43 and LSS varieties figures prominently. From 289F/43 three strains, 233F, 234F, and 238F, have been evolved, in which the original fibre length of the mother strain has been fully maintained, but the yield and ginning outturn have been considerably increased. These new strains are being extensively tested in the districts where the 289F/43 variety is grown. From LSS five strains resembling the original strain in habit of growth, nakedness of seeds, fibre length, and ginning outturn, but definitely earlier in ripening, have been built up, and their field performance will be tested.

22. A Study of the Fertilizing Value of the Silts Carried in Suspension by the Rivers of the Punjab. By R. C. Hoon and C. L. Dhawan (*Ind. J. Agr. Sci.*, February, 1944, p. 69.) The chemical analysis of silts carried in suspension by the various rivers of the Punjab has been discussed in order to throw some light on their fertilizing properties. It is shown that the silts contain very small quantities of nitrogen, phosphates, and potassium, and cannot thus be regarded as direct fertilizers. Differences between the silts of the various rivers have been brought out from a consideration of, firstly, the percentage fractions of the silts that are likely to reach the fields, and secondly, their calcium carbonate contents. It is shown that from the physical point of view the plains irrigated from the Sutlej and Indus would tend to become heavier as regards soil type and there would be little change in the soils of the Ravi, Chenab, and Jhelum areas. Deterioration of physical conditions may take place on the Sutlej and Indus but no material change would be expected on the areas served by the remaining rivers. Silts high in calcium carbonate may lead to deterioration of soils, while those low in calcium carbonate will have no harmful effects.

23. Sind: Marketing of Handloom Products. (*Ind. Frmg.*, July, 1943, p. 372.) The Government further extended up to March 31, 1944, the period of the scheme for

affording marketing facilities to the handloom industry in Sind, originally sanctioned in 1937. Under the scheme two associations were formed, one at Hyderabad and the other at Shikarpur. The main objects of the associations are as follows: to supply improved appliances on hire-purchase or otherwise; to supply raw materials at reasonable rates; to advise weavers and others in regard to the production of improved and easily marketable patterns and designs; to undertake preparatory and finishing processes and dyeing and printing in connection with the handloom industry; and to accept on consignment account against partial payment handloom products from weavers and to purchase outright handloom products and sell them.

24. Utilization of Indian Cottonseed. By D. Y. Athawale. (*Ind. Frmg.*, July, 1944, p. 307.) Deals briefly with the quality of Indian cottonseed; industrial utilization; treatment of cottonseed. Cottonseed crushing is slowly gaining ground in India. In 1937 there was only one mill in the country, but at the present time there are two large mills and more than a dozen medium-size mills in operation. The total quantity of seed crushed for the production of oil is over 300,000 tons annually. There are good prospects for developing the industry in Khandesh, Bombay, Central Provinces and Berar, Hyderabad, and Baroda, where the manufacture of vegetable ghee is steadily increasing.

25. Assam: Cotton Cultivation. By S. Chakrabarti. (*Ind. Frmg.*, June, 1943, p. 316.) Some years ago long-staple cotton was tried in Assam, but without success, and the trials were abandoned. Similar experiments were, however, again undertaken in 1939 by the Economic Botanist with about 100 varieties obtained from other provinces and from abroad. These experiments showed that long-staple cotton of a very fine quality with a staple of 1 in. or more could be successfully grown in the plains of Assam. A sample of one variety was sent to the Director, Cotton Technological Laboratory, Bombay, for test, and was reported on as follows: "Type Bani—fibre length 1·1 in., ginning percentage 34, warp counts 52s. Its fibre test results indicate it to be a long and extra fine type among Indian cottons. It has nearly 50 per cent. mature fibres, which is quite satisfactory among this class of cotton. If it can maintain these results in subsequent seasons it will mark a distinct achievement." Much, however, remains to be done, and it is proposed to undertake cross-breeding work with a view to evolving strains of high yield, good staple length and ginning percentage. It is also necessary to determine the tracts most suitable for growing long-staple cotton, and for this purpose seed of long-staple cotton will be tried out in 12 different centres in 1943-44.

Short-staple cotton is mainly grown in the hills of Assam, the area under it being about 38,000 acres. The types cultivated have very coarse fibre with lint of less than $\frac{1}{2}$ in.; the lint twists badly and the cottons are mainly used for mixture with wool. The methods of cultivation are primitive, and the types grown are mixtures of different strains. Experiments conducted by the Department of Agriculture showed that the deterioration of Assam's short-staple cotton was due to natural cross-pollination, but it was also found that types with high ginning percentage and lint of better quality with more than $\frac{1}{2}$ in. fibre length were in existence. The problem that presents itself, therefore, is the isolation of pure lines with high yield, high ginning percentage and uniform staple of $\frac{5}{8}$ in. to $\frac{3}{4}$ in. A botanical survey of the short-staple cotton-growing tracts of Assam was partially carried out in 1942-43, in the course of which the existing cultural practices were studied and material collected for selection and hybridization. The Department suggests the establishment of a cotton research station in the Garo Hills, the most important cotton-growing district of the province, to conduct systematic experiments with short-staple cotton in collaboration with the Indian Central Cotton Committee.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

26. Canada: The Textile Industry. (*Cotton*, M/c, 20/1/45.) According to reports developments in the Canadian cotton industry will be more in the direction of modernization. A recent survey has disclosed that fully one-third of the looms in

this section (total cotton looms about 22,000) will be scrapped and replaced with new equipment during the early post-war period. Much opening and lap-making machinery, spinning frames, and dyeing and finishing machinery will be scrapped, and more automatic winding and spooling machinery will be installed. The industry does not expect a great increase in its aggregate production, but is rather concerned with increased efficiency and greater diversity of lines. At present the primary textile industry in Canada employs 80,000 workers, of whom rather more than one-half are female, against about 65,000 in 1939. It is expected that domestic demand will be sufficient to provide employment for the present labour force for at least two or three years after the war, while efforts are being planned for expanding export trade, especially in full-fashioned hosiery, rayon fabrics, and certain heavy cotton cloths.

27. Scientific Research: Organization in Canada. By J. K. Robertson. (*Discovery*, **6**, 7, 1945, p. 47. From *Summ. Curr. Lit.*, xxv., **5**, 1945, p. 130.) A popular, illustrated account of the history of science in Canada.

28. AFRICA. East African Cottons. (*E. Afr. and Rhod.*, 2/11/44, p. 214.) In a recent broadcast Mr. W. A. M. Hesketh, in paying tribute to the quality of East African cottons, stated that the Gezira crop of 1944 was excellent, the grade, strength, and lustre being as good as if not better than ever before. Some of the 1944 crop bales had a new type of bale iron fastener instead of the four small iron studs; this new locking device was a great improvement on the old stud principle. Cottons marked AM (or Aboul Magid), DMSK and WN, grown on the banks of the White Nile, were also of excellent quality, and were suitable for making cloths for balloons, parachutes, and aeroplanes. The crop of the Tokar district was, as usual, of good quality, and was included among the best Egyptian cottons grown. The cottons of Uganda, Tanganyika, and Nyasaland were also much sought after by British manufacturers.

29. Gold Coast: Cotton Industry, 1943-44. A report received from the Dept. of Agriculture in April, 1945, states that no cotton was exported during the 1943-44 season, the total output being absorbed by the local weaving industry in which the Arts and Crafts industries of Achimota continue to take interest. Production showed a slight increase over that of 1942-43. In Togoland under British mandate the main types of cotton grown were Native Sonko and Kudra, which covered some 1,000 acres practically all interplanted in food farms. Yields were estimated at 55,000 lb. lint. On the Government agricultural station at Kpeve a small quantity of Sea Island cotton, obtained from the neighbouring territory under French mandate, was grown with success. In the Northern Territories cotton was grown on only a small scale and yields were normal at 100-200 lb. seed cotton per acre. Production on experimental stations was limited to small areas for seed maintenance. No developmental or experimental work was carried out during the year.

30. Kenya Colony: Prospects for 1944-45 Cotton Crop. A recent report from the Dept. of Agriculture states that in the Nyanza Province a reduced acreage was planted to cotton in the southern areas, and the crop suffered from dry weather in the early stages. Elsewhere planting and growing conditions were favourable, but at the time of writing (December) continued heavy rain was jeopardizing the prospects of a reasonable yield. In the Coast Province also a reduced acreage was planted, and there was some damage from heavy rain in October.

31. Locust Threat. (*Crown Col.*, April, 1945, p. 275.) In a recent review the Director of Agriculture said that the Colony would be faced with heavy layings during and after the long rains beginning in March, and big campaigns would be necessary for which Army co-operation would be forthcoming. It was difficult to forecast the general position. The only known fact about the last outbreak of desert locusts was that it lasted for seven years. The present outbreak started in 1940, and it might be expected to end in 1947.

32. Soil Conservation. (*Nature*, 3/2/45, p. 140.) In his first broadcast, on December 27, since he assumed office as Governor of Kenya, Sir Philip Mitchell dealt with one of the Colony's most pressing problems—soil erosion. He illustrated his

talk by reference to the Ukamba Reserve, where the far-advanced state of soil deterioration is causing grave anxiety. Here, said Sir Philip, is a salvage job that must be put in hand immediately. Much useful agricultural engineering work has already been done, but work needs to be greatly accelerated, otherwise "in a few years' time there will be nothing left of the Ukamba Reserve." Concurrently, a social reorganization leading to a changed attitude of the African to his land must be carried through. Sir Philip sees most hope for soil conservation in the establishment of a landlord-tenant relationship, the landlord being the tribe as a whole, and the tenant the head of the family. Such a system would ensure the greatest possible security of tenure for the good cultivator and none for the incorrigible land miner. But he sees no short cut to the ultimate goal of restoring the land to a state of stable fertility.

33. NIGERIA: COTTON SELECTION WORK, 1943-44. (*Ann. Rpt. Dpt. of Agr.* 1943-44.) *Northern Provinces.*—Selected Strains D5, D8 and D30 and their derivatives continue to be maintained by self-pollination; they are also being multiplied for distribution. The cotton selection work has assumed a much more encouraging aspect with the production of the strain 26C (a derivative of D5). It yielded 60 per cent. more than the standard B.C.G.A. Allen ex Zaria ginnery in 1939, and 100 per cent. in 1942-43. The strain is slightly stronger than ordinary Allen, and favourable reports on it have been received from brokers and spinners. Two miniature bales, one of 26C and the other of standard Allen, grown under similar conditions, were sent to the Shirley Institute for spinning tests in August, 1943, and the results indicated that the hair characters of the two samples were practically the same, and that the two samples showed no appreciable difference in the spinning tests. Seeing that the yield of lint per acre of 26C is apparently double that of standard Allen, the results of the tests were very satisfactory. 26C is the most promising strain which the Senior Botanist has so far produced, and he is to be congratulated on a result which has taken many years of patient work and many disappointments. The strain will be multiplied for general distribution as soon as possible. 56,700 lb. of seed of D5, D8 and D30, multiplied on 410 acres at Daudawa in 1942, were issued to Awai farmers for planting in 1943. In 1943, 500 lb. of seed of D5, D8, and D30 mixture were issued to Daudawa for their stage I multiplication.

Southern Provinces.—Doubts having been expressed about the continued self-pollination of Ishan cotton, two bulk strains were tested for yield, half of each arising from self-pollination, the rest from open pollination. On the average, self-pollination did not appear to depress yields, but in the poorer family the self-pollinated strain was significantly lower in yield. The better self-pollinated strain will be used for planting next season. Both self and open pollinated seed from 16 plants of the strain have been harvested. The strains of cotton selected for rough lint have proved inferior to Ishan A in yield, and either worse or no better in roughness of lint and hairiness of leaf. These have been abandoned.

34. COTTON PROSPECTS, 1944-45. (*Half-yrly. Rpt. to Sept.* 30, 1944.) *Northern Provinces.*—The amount of seed distributed was some 900 tons less than the previous year, owing to the continuation of the policy to assist the campaign for maximum groundnut production. The previous decision that no gazetted cotton markets should be opened in the northern parts of Sokoto and Katsina provinces, or in the provinces of Kano and Bauchi, has been continued this year, and only sufficient cottonseed has been issued to those areas to cater for the local internal trade. Prospects throughout the cotton belt are only mediocre. The rains commenced a month late, which gave all farming operations a bad start and held up the planting of cotton. Subsequent rains were badly distributed, and there was a certain amount of waterlogging during August, which retarded growth. Finally, a drought during the latter half of September, coupled with neglected cultivation during the fast of Ramadan (which fell this year between August and September), dispelled any hope of high yields. The minimum price has been raised this year to 1·7d. per lb., and since unchecked competition may make this merely a token figure, it is not unlikely that cotton usually reserved for the internal trade may be released for the export market.

Southern Provinces.—Ishan seed distribution was carried out in Oyo, Abeokuta, and Ondo Provinces from June 1 until the end of August. All available Ishan seed from Meko No. 2 multiplication area was distributed, and also small quantities of commercial seed after careful picking. Reports to date show that the prospects for the present crop appear favourable, but it is yet too early to make any approximate forecast. It is highly probable that the internal trade will continue to absorb large quantities of available seed cotton, but the proposed higher prices for export cotton may release a greater proportion for export.

35. Daudawa Farm. (*Ann. Rpt. Dpt. Agr., Nigeria*, 1943-44.) The multiplication of cotton seed continues to be the primary object of Daudawa, and the Nigerian Government continues to receive a grant of £1,600 per annum from the Empire Cotton Growing Corporation for its upkeep. The yield of seed cotton in 1943-44 was the highest ever recorded on the home farm, averaging 402 lb. seed cotton per acre over 130 acres. 750 acres of the estate are now farmed by 49 smallholder settlers who had 350 acres under cotton. Yields, however, were disappointing, averaging only 189 lb. seed cotton per acre. It was a short cotton season without any late rain in October, and planting was late. This settlement scheme has been a great success, and may well serve as a model for soldier settlement schemes. Eight new units were added in 1943 and a further twelve are being prepared for 1944. Of the 49 settlers, only 3 have yet failed to pay off their advance in full. The remainder have credits, according to their accounts, of over £350, in addition to which they own some 200 cattle. As most of these men were poverty-stricken farmers or casual labourers a few years ago, this is a clear proof that the system of mixed farming practised at Daudawa is a sound economic proposition for peasant farming. With adequate funds and staff this scheme is capable of almost unlimited expansion.

36. Nyasaland: The Misuku Land Usage Scheme. By D. N. Smalley. (*Nyasaland Agr. Qrtrly. J.*, July, 1944, p. 1.) In this paper the author summarizes the achievements of 5½ years' work carried out under his supervision during 1938-1944, to check the disastrous soil erosion which was ruining the Misuku area. The district was inhabited by the Asukwa tribe, and the erosion was caused by their wanton felling of trees to obtain the fruits and berries upon which they mainly lived, and also by their reckless cultivation of steep slopes which rendered them unproductive, and from which they were compelled to shift to adjacent untouched areas, which they treated in the same way. In this manner was the policy of shifting agriculture in these parts born, and with the further addition of cattle as tribal wealth, the damage and erosion on all sides was accelerated, through sheer ignorance on the part of the agriculturist or cattle owner. In 1937 the position had become critical. There was chronic sheet erosion throughout the 600 sq. miles of the Misuku country; many streams were already dry, and the few remaining about to dry up; people were living below the subsistence margin, and there were no food reserves whatever in the area; the remaining small rain forests were being rapidly depleted; domestic timber supplies were inadequate, and there was no timber conservation policy; grass and timber burning was heavy and uncontrolled; and there was gross ignorance of simple grazing and herd control.

The first difficulty to overcome was the hostility of the people, who resented any attempt to induce them to change their ways, and when protective belts of banana, elephant grass, or sugar-cane were planted, many of them moved away from the district. The results of the first year's work, therefore, were disappointing, and showed little progress. In the second year, however, some people were found who agreed to carry out the new technique assisted by the Instructional Staff, and since they obtained much better results on their lands they were mildly convinced of the value of the new teachings. Further stretches of stream banks were closed to cattle and protected by vegetation, and all grass and bush burning was forbidden in the area for three years. This order was extremely well carried out. In the third year the scheme was well under way, and there were many willing co-operators. During the fourth year it was felt that sufficient instructional and demonstrational work had been carried out to warrant the Native Authority making an Order for the compulsory

adoption by the Misuku people of such protective measures as were advised. Much progress was now being made on all sides, and the Instructional Staff had become welcome members of the community. It was also noticed that many of the earlier deserters from the Misuku area were now returning to their old lands and willingly participating in the scheme. For the first time in their history 77 tons of beans were sold for export from the Misuku crops after the people's own needs had been satisfied. The fifth year was a matter of routine and consolidation with improvements and extensions where required.

The author reports that as a result of the work carried out during the 5½ years soil erosion has been checked throughout the area; many previously dry rivers and streams are giving abundant water supplies throughout the year; an ample food supply has been secured on a reduced acreage, making seasonal periods of land rest now possible; a substantial acreage of land is ready for immediate cash crops development, independent of food lands; the water table has been raised, enabling valley bottoms to be used for food production; over 2,000 miles of river and stream banks have been fully protected, incidentally providing vast food reserves of bananas. In addition, each village has several demarcated areas under natural timber regeneration, cattle grazing lands have been abundantly restored, and better animal husbandry has resulted.

From the experience gained in the Misuku area the author suffers from no illusion on the subject of the application of a similar technique throughout the Protectorate. It is realized that each locality will have its peculiar and special problems, as there is, unfortunately, no single panacea for all agricultural ailments. There are, however, a few points of general application that may be of use elsewhere: No areas should be classified as beyond repair; a harmonious team spirit is essential between technical and administrative officers to ensure success in the work; planning and execution should be dynamic; half-heartedness at any point is likely to spell disaster.

37. NORTHERN RHODESIA: COTTON CULTIVATION, 1942-43. (*Ann. Rpt. Dpt. Agr.*, 1942-43, received 1944.) In contrast with the tobacco industry, the Marambo cotton-growing project suffered a setback. The number of growers fell to less than 300 and production to 46,000 lb. seed cotton. The planting season was late and unfavourable and was followed by heavy rains and floods. Some alluvial gardens were, in fact, completely washed away. Stainer and bollworm damage was heavier than usual. The crop was purchased at ¾d. per lb. and was ginned and baled departmentally. The average return to the grower was but 9s. 8d. A trial consignment of 4 tons of lint was despatched to Gatooma, Southern Rhodesia, and sold at 9d. per lb. The cleanliness and quality of the lint received favourable comment. The balance was disposed of locally.

38. COTTON INDUSTRY, 1943-44. A recent report from the Dept. of Agriculture states that cotton cultivation was confined to the Marambo area of the Luangwa Valley. Planting conditions were difficult and, due to other demands for man power, the number of growers declined. Production amounted to only a few bales, but the cotton was clean and healthy.

39. SOUTHERN RHODESIA: COTTON INDUSTRY, 1943-44. From a report by Major G. S. Cameron we learn that the acreage planted to cotton showed, for the fourth year in succession, an increase over the previous season. In regard to European production, 6,053 acres yielded 2,071,401 lb. seed cotton. The quality of the crop was remarkable for the exceptionally good, white colour of the cotton and for cleanliness, as reflected by the high proportion of good grade, good colour cotton. The staple length, however, was somewhat below average. Ginning operations started on June 14 and were completed on October 25. Stoppages due to mechanical breakdown and other causes amounted only to 2½ per cent. of actual ginning time. This satisfactory result was due to the overhaul given the plant by Mr. R. Cameron, and to the supervision of the ginning operations by Mr. F. Green, who also attended to the preliminary seed cotton classification.

40. SOUTH AFRICA: COTTON INDUSTRY, 1943-44. A report recently received states that early planted cotton got away well, and although December was somewhat dry,

early 1944 rains and high temperatures helped considerably. Prices paid for the crop were considered fair, ranging from 8·45 to 9·25 pence f.o.r. ginnery. Grades were good, the bulk being Good and Strict Middling, good colour. Off colour only totalled a few bales. Nearly the whole of the crop was of good 1⅛ inch staple.

41. Cotton Industry Prospects, 1944-45, Barberton Area. A note received from Mr. Parnell states that approximately 600 acres have been planted, about two-thirds of the final acreage of the previous season. The reduction is mainly due to the very late and erratic planting rains, but on present prices cotton is definitely unattractive as compared with other farm produce. The crop is mainly late planted, but is in fair condition in spite of poor rains.

Experiment Station.—A very difficult planting season, with short rainfall following a very dry winter, has given the cotton a poor start. Plantings range from October 20 to December 26. The earliest sowings are mainly good and have fruited well so far; the latest will be too late to give good material for selection work unless growing conditions improve quickly.

42. Soil Fertility Experiments. (*Trop. Agr.*, February, 1945, p. 40.) The Agricultural Research Institute, Pretoria, is carrying out large-scale experiments on soil fertility. Investigation into the effect of climate on the availability of plant nutrients has shown that the soils are not deficient in phosphorus, as is commonly believed, but that a heavy rainfall is required to make the phosphorus available to the plant. Availability of nitrogen, on the other hand, is not reduced by a dry climate. The Institute has no fewer than 366 irrigated plots to test the effect of various fertilizers on irrigated crops under two rotational systems. Erosion control is being studied on erosion plots having a 3·75 per cent. slope and on run-off plots with a 7 per cent. slope. Some alarming results on the rate of erosion have been obtained. Under arable crops the amount of run-off has been found to amount to approximately 20 per cent. per annum of the rainfall, with a rate of erosion of approximately 10 tons to the acre per annum. Bare soil, uncultivated over the period of the experiments, has given an annual run-off of about 45 per cent., with nearly 20 tons of soil per acre eroded annually. In striking contrast, undisturbed veld has given a run-off of less than 1 per cent., while the amount of erosion in this case is so small as to be hardly measurable. Percolation experiments have shown that little water is lost when a crop is growing, but that in uncultivated ground the loss may be 12·5 per cent. of the annual rainfall. The nitrogen losses on the cultivated and uncultivated plots are 75 lb. and 400 lb. per acre per annum.

43. Swaziland: Cotton Industry, 1943-44. A note from Mr. Lochrie is to the effect that the season was favourable for cotton as good rains fell early, but the almost complete disappearance of cotton as a crop is attributed to (i) the concern of natives with their food crops; (ii) more attractive sources of income from employment and from the sale of cattle at high prices; (iii) the relatively low prices obtainable for cotton compared with those for other agricultural products. In a few of the native holdings excellent yields up to 700 lb. seed cotton per acre were obtained.

For the reasons given above no increase in acreage is expected in the 1944-45 season.

44. Soil Conservation in the Anglo-Egyptian Sudan. By E. N. Corbyn, formerly Governor of Khartoum. (*Nature*, 20/1/45, p. 70.) In December, 1942, a committee was appointed by the Governor-General of the Anglo-Egyptian Sudan to consider the problem of soil conservation in the Sudan. The terms of reference of the Committee were: (*a*) To report on the present situation in the Sudan with regard to soil erosion and desiccation, and the availability of rural water supplies for the human and animal population. (*b*) To make recommendations in respect of any of the above matters and of any measures of legislation or taxation which may be required for the carrying out of such recommendations. (*c*) To draw up a programme of work covering a stated period of years for the implementation of the recommendations. (*d*) To provide estimates of the capital cost of carrying out the programme and of the future maintenance costs involved. The findings of the

Committee are securely based on the best expert scientific knowledge available to the Government, and the standard of the Sudan in such matters is high.

The Committee's survey of existing conditions in the Sudan showed many and serious examples of soil deterioration. Sheet erosion and gully erosion were found to be occurring in many places; deterioration of forest watersheds due to fires and grazing; spoliation of agricultural land by silt dune formation; and spoliation of rain-watered agricultural land by out-of-season fires were also noted in many areas. Finally, town and village peripheries were found to be deteriorating rapidly all over the country, owing to over-cultivation and over-grazing of the surrounding areas and excessive cutting of trees for firewood in the neighbourhood of towns.

An extensive programme of more than fifty items, covering different danger-points spread over all the eight provinces of the Sudan, is put forward by the Committee, to some thirty of which a priority classification is given as matters of urgency. The remedies recommended fall under main headings as follows: (1) *Methods of rain and flood-water control:* gully plugging; contour terracing; protection of heads of catchment areas. (2) *Forest protection:* reservation of forest areas to an increased extent; protection from fire; reafforestation; control of firewood supplies. (3) *Treatment of cultivable rain-watered grasslands:* control of annual burning methods; fire protection. (4) *Control of town perimeters, including reservation of areas for the growing and supply of fodder for domestic animals, and for firewood, whether from near or distant sources:* control of village planning, so far as necessary to ensure conservation and the best use of the soil of village areas; control of the grazing habits of nomads, so far as necessary to avoid deterioration in the soil of grazing areas.

Two great merits of the report are that its recommendations apply these remedies to definite schemes at definite places, and that financial estimates of the cost of these schemes on a basis of a five-year experimental period are worked out and provided, totalling in the first instance to a sum of £300,000, spread over five years, to be at the disposal of a board appointed for the purpose. A considerable part of the Committee's recommendations falls under the heading of improvement of water supplies, a most important matter in so arid a country, and one which in itself will relieve the strain on soil surrounding the water-points which exist already in agricultural and grazing areas.

The Sudan Government has accepted the main recommendations of the Committee, and will make the necessary funds available for the five-year trial period envisaged. It has appointed a Water Supplies and Soil Conservation Board to administer the funds provided and to take executive action on the schemes proposed.

45. SUDAN: FUTURE OF THE GEZIRA. (*Crown Col.*, March, 1945, p. 206.) Opening the debate on the Gezira scheme at the second session of the Advisory Council for the Northern Sudan, the Financial Secretary, Mr. J. W. E. Miller, said that physical conditions would allow the Gezira to be doubled in size if water were made available, but such development could be undertaken only with the financial support of the whole country and under efficient management. He explained that it was the Government's intention on taking over from the cotton companies to install management by a Board, after the fashion of the Gash Board system operating at Kassala. The new Board, on which there would be representatives of the tenantry, would be a decentralized agency, but it would work within the framework and for the objectives of policy fixed by the Government. At the Financial Secretary's suggestion, the Council set up a committee to study the scheme.

46. TANGANYIKA: COTTON PRICES. (*Crown Col.*, December, 1944, p. 880.) The Government has agreed to increase the basic price of seed cotton during 1945 to 14 cents a lb. or 32 cents a kilo. While it is hoped that this increase will act as an incentive to the planting of larger acreages of cotton for the 1945 crop, it is pointed out that food production still remains of the highest importance.

47. UGANDA: COTTON PROSPECTS, 1944-45. The report of the Dept. of Agriculture for December last stated that prospects improved materially in all zones with the appearance of dry weather; blackarm and boll rot, which were assuming serious

proportions in the Busoga zone of the Eastern Province, and in Buganda Province, were also checked by the onset of dry weather, and provided this continues later plantings generally are expected to give good yields.

48. Cotton Tax. (*Crown Col.*, March, 1945, p. 205.) In his Budget speech the Acting Governor said that the Government welcomed the suggestion from Unofficial Members that the cotton export duty should be increased from 3 to 5 cents. It seemed only right that a share of the benefit derivable from the higher prices anticipated during the coming season should be made available to support the Protectorate's revenue position, and assist in financing the progressive measures embodied in the Budget. Under existing control arrangements fixed prices were guaranteed to the grower, and the grower would not pay any part of the tax.

49. Profits of Cotton Control. (*E. Afr. and Rhod.*, 2/11/44, p. 208.) In October last, the Secretary of State for the Colonies stated that the estimated profit from the controlled marketing of cotton amounted to not less than £2,400,000 in respect of the crop years 1942-43 and 1943-44. The general intention was that the profits should be expended for the benefit of the areas in which the production took place, and the Governor had set up a committee, which after consultation with all interests concerned in growing, processing, and marketing, would recommend, in order of priority and in broad outline, the objects for which the funds accumulated should be used.

50. Cotton Exports. (*Crown Col.*, March, 1945, p. 205.) The output of cotton in the 1943-44 season was not large on normal standards, though there was considerable improvement on that of the preceding season. The cotton acreage planted for the 1944-45 season was less than in the previous year, but higher yields are expected. Regarding the disposal of the coming crop, negotiations have been conducted which are expected to result in a similar arrangement to that of last year, when such cotton as was not required by the Ministry of Supply was sold to India at an agreed price.

51. Spinning and Weaving. (*Crown Col.*, February, 1945, p. 133.) The local spinning and weaving workshops, started two years ago by the Uganda Industrial Committee, are being closed at the end of January. Inquiries reveal that while African operatives make good weavers, they are most disappointing as spinners. The latter work does not interest them, and their output is so small that it is impossible to offer attractive pay rates. It appears that while the future may hold a small field for locally produced handweaves woven from imported machine-made yarn—these weaves selling as a luxury article to tourists and in the specialized gift market—there can be no large production of local handweaves capable of competing with imported piecegoods.

52. B.P. 52 Cotton. (*Crown Col.*, December, 1944, p. 879.) The new B.P.52 seed is now planted throughout Buganda, and Busoga is following suit. According to the report of the Joint East African Board the excellence of the lint produced from this seed has given Lancashire spinners a new view of the quality of Uganda cotton as compared with Egyptian Uppers.

53. AUSTRALASIA. Queensland: A Review of the 1943-44 Cotton Growing Season. By W. G. Wells. (*Queens. Agr. J.*, November, 1944, p. 264.) Climatic conditions were favourable at the commencement of the season, but shortage of labour handicapped the growers and prevented them from dealing effectively with the excessive weed growth resulting from the very heavy rainfall during December. In addition, prolonged hot, dry conditions during January reduced yields appreciably, but where good cultural practices had been followed yields were fairly satisfactory. Harvesting operations were also handicapped by shortage of labour in all districts, and a considerable proportion of the cotton was harvested by snapping, with consequent lowering of the grade. The results obtained from growing cotton with supplementary irrigation supplied from individually owned irrigation plants was not satisfactory. Generally, co-operators either did not plant because of labour shortage or, for the same reason, were unable to maintain clean cultivation on the fertile alluvial soils under the wet spring and early summer conditions. Experiments

carried out at the Biloela Research Station indicated once again the advantages gained by planting cotton in the first three seasons following Rhodes grass.

Cotton Breeding.—In the Central and Upper Burnett districts work was continued with the Triumph variety, generally considered to be the best cotton for those areas, and several of the newer strains evolved showed sufficient superiority over the parent stock to warrant their multiplication for eventually replacing it. Satisfactory progress was also achieved with Lone Star, the best variety for the harder, less forcing soils in the drier cotton-growing districts, and the seed stocks of the most advanced strains were multiplied up with a view to replacing the older Lone Star cottons. In connection with Miller cotton—the most extensively cultivated variety in the State—very promising results were obtained in the work of developing jassid-resistant types, and the seed of these will also be multiplied up to supply areas where a jassid-resistant Miller variety is required. Breeding operations with the New Mexico strain, which is suitable for growing with supplementary irrigation in the Central district, the drier sections of the Upper Burnett, and in the South Burnett district, resulted in several promising types being retained for further test. The ability of the Qualla variety to withstand very dry conditions when grown on infertile soil was again amply demonstrated in the breeding plots in the Moreton district, and a number of very promising new selections and twelve progeny increases were retained for further test.

54. Cotton Prospects, 1944-45. A report from the Director of Cotton Culture, received in February last, was to the effect that the abnormally dry conditions prevailing throughout the winter and well past the best planting period for cotton, coupled with the necessity for conserving labour for production of food crops for the Allied armies, resulted in a considerably less acreage being planted to cotton, and a smaller crop was anticipated. A later report received in March stated that the average condition of the cotton crops in the West Moreton and South and Upper Burnett districts had improved following the occurrence of timely rains at the end of January and again in February. The crops in the Central Burnett had barely maintained their prospects, however, while in the Central district the continuance of mostly very hot, dry weather, broken by a few hard thunderstorms of the run-off type had seriously checked plant growth, many crops in the Callide Valley being so badly affected that considerable abandonment of acreage was expected as a result.

55. Commercial Cotton Varieties. By R. W. Peters. (*Queens. Agr. J.*, May, June, 1944, pp. 275, 337.) The varieties of cotton grown in Queensland are all of the American Upland type, since this class of cotton appears most suitable for the main cotton-growing areas, the climatic and soil conditions of which are somewhat similar to those ruling in many parts of the United States where this type of American cotton is grown. All these cottons, with their large bolls and coarse fibre, can be picked and ginned much cheaper than the small boll, fine fibre, long-staple types of cotton. This is an important consideration, since the cost of production and harvesting is one of the main problems connected with cotton-growing in Queensland. By means of a comprehensive breeding programme several improved cottons have been evolved, and some are being commercially grown. Brief accounts are given of the most successful cottons, Lone Star, Miller, Triumph, New Mexico Acala, and Farm Relief. The Cotton Section of the Dept. of Agriculture and Stock has also under investigation a number of other varieties of cotton which have more recently been imported, and the most promising of these will be tested in a comprehensive set of district trials to ascertain their merits as compared with the main varieties grown.

56. The Best Time to Plant Cotton. By W. G. Wells. (*Queens. Agr. J.*, September, 1944, p. 184.) The best time to plant cotton in the areas south of Mackay is from late September to mid-October in the Central district and from mid-October to mid-November in the districts south of that area. Where cotton is planted during the first three seasons following grassland, slightly later plantings can normally be expected to produce reasonably satisfactory yields, particularly when suitable quick-maturing varieties are grown. Where cotton is to be grown on old

fertile alluvial cultivations, either with or without the assistance of supplementary irrigation, it is definitely advisable to plant around mid-October if at all practicable. Later plantings on such soils may make rank plant growth if very wet weather is experienced in the early part of the regular wet season, and as a result of such growth may suffer a severe loss of crop through either following stress conditions or insect pest attacks, or both.

57. Crop Rotations for Farms in Cotton Districts. By W. G. Wells. (*Queens. Agr. J.*, August, 1944, p. 76.) The decline in the productivity of both pastures and old cultivations on dairy-cotton farms in districts receiving an average annual rainfall of less than 30 ins. makes it highly desirable that farmers should consider suitable remedial measures. Generally speaking, failure to practise suitable rotations has been the cause of reduced yields from both pastures and cultivated crops. The productivity of pastures can be greatly improved by ploughing them out, growing cotton for one to three years according to the fertility of the soil, and then establishing Rhodes grass for at least three years. Investigations have also demonstrated that cotton crops yield particularly well during the first three seasons following grassland. There is a better balance of plant foods required by the cotton crop, and the surface soil is kept more permeable with such a rotation than is the case where the land is cropped for long periods. The improved permeability of the surface soils permits better rainfall penetration than occurs in old cultivations, particularly heavy clay loams and clays, thereby providing more subsoil moisture for the crops. It is advisable too, to incorporate Rhodes grass in rotations including summer and winter growing fodder and grain crops. There may be insufficient nitrogen for these crops, however, in the first year after Rhodes grass. Cotton should therefore be the first crop planted after the pasture is ploughed, as the cultural operations in this crop stimulate the production of sufficient nitrogen for the following fodder crops. Where Rhodes grass is to be established on land that has been cropped to cereals or sorghums for some years, an early planted cowpea crop for grazing or several months' cultivated fallow should precede the establishment of the Rhodes grass, to provide sufficient nitrogen to promote a satisfactory growth of the pasture.

58. Thinning and Early Cultivation of Cotton. By W. G. Wells. (*Queens. Agr. J.*, October, 1944, p. 202.) Early ploughing when applied in conjunction with the grassland-cotton rotation improves the possibilities of providing a good supply of subsoil moisture prior to planting the cotton. Experiments carried out over a period of years have shown the value of clean cultivation throughout the growth of the cotton plants and of thinning when the plants are from 5-8 inches tall, both practices assisting to conserve the moisture in the surface soils for the use of the rapidly growing plants. To reduce the costs of the thinning operations and of early cultivations the suitability of the crop for cross-harrowing should be tested. Wher the stand of seedlings is thick, and the surface of the field is relatively free from trash and pieces of roots, cross-harrowing with a spike-tooth harrow will eliminate many bunches of the cotton seedlings without adversely affecting the stand. The removal of these excess plants prevents the development of spindly growth, which usually occurs when the stand of seedlings is too thick. Where cross-harrowing cannot be practised, the usual method of inter-row cultivation, for which the farmer is equipped, should be employed as soon as the rows of cotton are discernible. This operation will destroy any weed and grass seedlings germinating between the rows at the same time as the cotton. A similar cultivation should be given following each storm occurring during the early development of the cotton crop.

59. The Value of Rhodes Grass on Mixed Dairying and Cotton-Growing Farms. By W. G. Wells. (*Queens. Agr. J.*, July, 1944, p. 15.) Investigations conducted at the Biloela Research Station, in the Callide Valley, Queensland, have indicated that the best yields of cotton are normally obtained during the first three seasons after virgin grassland is ploughed. Virgin grassland is, however, not always available on the farm, and various cropping rotations in which cotton is an essential crop have also been extensively tested. One of these rotations, in which three years of Rhodes grass are followed by three years of cotton before the pasture is re-estab-

lished, has produced the next best yields of cotton. Information on the yields and quality of Rhodes grass obtained in this rotation indicates that it will enable the dairy farmer in the districts suitable for Rhodes grass to maintain satisfactory pastures for his cows.

60. Fiji: Annual Report of Dept. of Agriculture, 1942-43. By H. W. Jack. (*Agr. J.*, September, 1944.) *Cotton.*—No seed was issued and the ginneries did not operate. The remainder of the stocks of lint held over from the 1939-41 seasons was disposed of locally. In the absence of any considerable local production of kapok there is a good local demand for lint, largely for upholstery purposes, but the crop is not attractive to growers at economic prices.

61. WEST INDIES. Report of the Eighth and Ninth Ordinary General Meetings and of an Extraordinary General Meeting of the West Indian Sea Island Cotton Association (Incorporated). The report contains the minutes of the Eighth and Ninth Ordinary General Meetings (held in Trinidad on November 17, 1943 and May 11, 1944 respectively) and of an Extraordinary General Meeting held on June 5, 1944. Statistics and other memoranda relating to the British West Indian Sea Island cotton industry are also included. Owing to transport difficulties the Eighth meeting was held as a *pro forma* meeting in Trinidad at which persons resident in Trinidad represented the several member Associations. The majority of member Associations were, however, able to send delegates to the Ninth meeting.

In his address at the Ninth meeting the President, Mr. C. C. Skeete, gave an account of Sea Island cotton production during the previous two years. He paid tribute to the valuable work on cotton breeding and seed supply carried out at the cotton breeding stations of St. Vincent and Montserrat under the able guidance of Mr. J. B. Hutchinson, Geneticist of the Empire Cotton Corporation's Research Station in Trinidad.

At the conclusion of his address the president announced that he had accepted appointment as Director of Agriculture in the Windward Islands and would, therefore, be resigning from the post of Acting Commissioner for Agriculture at the Imperial College of Tropical Agriculture in Trinidad. It was the intention of the Governing Body of the College now to abolish the post, and members decided that in these circumstances no useful purpose would be served by the Association continuing to be established in Trinidad, and that a more suitable arrangement would be for the registered office to be transferred to the Leeward Islands where the bulk of Sea Island cotton in the British West Indies is produced. Accordingly at an Extraordinary General Meeting held on June 5 it was resolved that the Association registered in Trinidad be wound up and a new Association on the same lines as the old one be formed and registered in Antigua.

62. Ginnery for Carriacou. (*Crown Col.*, December, 1944, p. 888.) It is proposed to establish a central ginnery at Carriacou to deal with the whole of the Marie Galante cotton grown there and in the St. Vincent Grenadines. The Grenada and St. Vincent authorities have approved a recommendation to this effect by the Cotton Adviser, Mr. J. B. Hutchinson. The Comptroller for West Indian Development and Welfare is understood to have promised to support an application for financial assistance.

COTTON IN THE UNITED STATES.

63. Cost of Picking the 1944 American Cotton Crop. (*Cotton*, M/c, 24/2/45.) American farmers have paid an average of \$1.92 per 100 lb. of seed cotton for picking this season's cotton crop. This is the highest price paid in any of the 21 years for which records are available. New record rates occurred in 17 of the 19 cotton states, the exceptions being Kansas, an unimportant cotton-producing State, in which there was a decline of 15 cents, and in Arizona, where the marked reduction in the production of American-Egyptian cotton, for which the picking rate is considerably higher, was largely responsible for the decline of 45 cents per 100 lb. in the State average.

64. American Cotton Crop: Statistics by Grade and Staple, 1932-43. (*Text. Wkly.*, **34,** 1944, p. 1122; **35,** 1945, p. 38. From *Summ. Curr. Lit.*, xxv., **3,** 1945, p. 47.) (1) Annual figures for the carry-over, crop, supply and consumption (disappearance) of American cotton for 1932-43 are tabulated for the six grades of white (G.M. and better, S.M., M., S.L.M., L.M., S.G.O.+G.O.), the three grades of spotted cotton (S.M. and better, M., and S.L.M.), and other coloured cottons. (2) Figures under the same headings are tabulated according to eight staple length groups from $\frac{13}{16}$ in. and shorter to $1\frac{1}{4}$ in. and longer.

65. Cotton Price Stabilization Agreement. (*Cotton*, M/c, 21/10/44.) The United States War Food Administration and the Office of Price Administration announced jointly early last month a revision of the Cotton Price Stabilization Agreement of April 24, 1943. Under the revised agreement, the Commodity Credit Corporation " will not offer for sale any of the cotton owned or controlled by it except at prices which will not prevent cotton from averaging parity." In accordance with this agreement, the C.C.C.'s sales price for " Middling " $\frac{15}{16}$ in. cotton compressed to standard density stored in the Group B mill area of the Carolinas was increased 50 points from 22·85 to 23·35 cents per pound. The increase of 50 points above the parity-equivalent price will not be reduced prior to May 1, 1945, unless the price of cotton should average above parity in an amount and for a period of time sufficient to raise a question as to the adequacy of manufacturing margins under ceiling prices that are being computed for major cotton textiles on the basis of parity prices for cotton. In that event the C.C.C. sales price of cotton will be reduced only enough " to prevent the price of cotton from averaging above parity." W.F.A. and O.P.A. further agreed that " no ceiling price is to be placed on raw cotton prior to May 1, 1945, below the price at which, under the terms of the agreement, the Commodity Credit Corporation will offer cotton for sale." The new agreement between the two agencies was in furtherance of the Stabilization Extension Act of 1944, which directed the President to " take all lawful action to assure that the producer of cotton receives not less than parity."

66. American Cotton. First Commercial Acreage to be Produced by Mechanical Methods. (*Cotton*, M/c, 28/10/44.) A revolutionary point in the history of cotton-growing in America was reached in October last in Clarksdale, Mississippi, when the harvest was begun on the first commercial acreage of cotton produced by completely mechanical methods. An eleven-hectare field was ploughed, planted, cultivated, and harvested entirely by machinery. The cotton land ploughed was prepared in the spring by tractors and farm implements. Planting was then done with a seeder. Weeds were destroyed by flame. Miniature flame-throwers mounted on machinery moved down the rows, blasting the young weed growth, the field being treated in this manner six times during the growing season. The cotton plants, with their tough, bark-like stems, were not injured by the flame which easily destroyed the green leaf-blades of the weeds. When picking started the mechanical cotton pickers —development of which is still in the experimental stage—picked approximately three-tenths of a hectare per hour, doing in one day the work of 100 cotton pickers. A week before the harvest, to facilitate picking, the leaves were removed from the plants. This was done by flying over the field in an airplane which dusted the plants with cyanamid, causing the leaves to drop off within seven days, leaving only stems and fluffy white cotton bolls.

67. Observations on Plant Breeding and Seed Distribution in the United States. By J. B. Harrington. (*Rpt. 11th Ann. Mtg. Univ. Sask., Canad. Seed Gr. Ass.*, 1940. From *Pl. Bre. Abs.*, xv., **1,** 1945, p. 3.) A review of plant breeding projects and an account of the organization of seed distribution in the United States.

68. U.S. Government Extension of Quarantine on Pink Bollworm. (*Cotton*, M/c, 13/1/45.) The pink bollworm quarantine and regulations have been revised (effective November 9, 1944), to add to the regulated area several counties in Southern Texas, and to classify as heavily infested four Texas counties and parts of two others in the lower Rio Grande Valley that were heretofore considered as lightly infested. As an additional safeguard in the movement of cottonseed, the new regulations

require that cottonseed produced in heavily infested areas, and moved to contiguous lightly infested areas for processing, is subject to two heat treatments. The new order supersedes all previous revisions of the quarantine.

69. United States Textile Research Institute. (*Text. Res.*, xiii., **14**, 1943, pp. 4 and 12. From *J. Text. Inst.*, May, 1944, A225.) *Organization and Plans.*—F. S. Blanchard. A report is given of the organization, progress and future plans of the U.S. Textile Research Institute. A number of supplements and information reports on mildew-proofing of military fabrics, water-repellency, fire-proofing, bibliography of nylon, handling of high density cotton, etc., have been issued, and a committee on economic research has been set up. It has been decided (1) that the Institute should cover all branches of the textile industry, and all fibres; (2) that the laboratories should be near but not in New York; (3) that the Institute should have a five-point programme covering (*a*) fundamental research, (*b*) applied research and mill contacts, (*c*) a graduate school in affiliation with a leading university, (*d*) economic research, (*e*) information service, publications, abstracts, library, etc.; and (4) that a research fund of $300,000 a year for five years, or $1,500,000 plus a capital fund of $500,000, should be solicited from all major branches of the industry. The Textile Research Institute is working in close co-operation with the Textile Foundation.

Applied Research Programme.—G. E. Hopkins. The applied research work will attempt to develop the application of fundamental principles to a point where competent mill technical staffs can " pick up the ball." The Director hopes to visit the technical staffs of all members to learn their problems, and from these to select common denominators of value to sections of the industry and requiring more comprehensive study than may be afforded by individual laboratories. The contacts will include all laboratories working in the textile field. In addition the work of the engineering laboratories, the equipment manufacturers, the chemical industry and the electrical industry will be closely followed. The establishment of a large independent laboratory is not contemplated. The research committee, supplemented by consultants to be called upon according to particular problems, will subcontract the actual work to existing facilities, textile schools, engineering schools and sometimes members' laboratories. The functions of the applied research section are defined as recognition and definition of common problems, determination of the principles involved in their solution, selection and provision of proper facilities for their study, and the interpretation and distribution of the results.

70. Textile Processing Research: Organization. American Assn. of Textile Chemists and Colourists. (*Amer. Dyes Rpt.*, **33**, 1944, p. 82. From *Summ. Curr. Lit.*, xxiv., **20**, 1944, p. 483.) Recommendations are put forward for the reorganization of the research activities of the Association. They include (1) a budget of about $35,000 a year for the next five years, (2) the appointment of a permanent Director of Research, (3) more frequent publication of progress reports, and (4) establishment of research headquarters at the Lowell Textile Institute.

71. United States Southern Regional Research Laboratory: Research Work and Equipment. (*J. App. Physics*, **15**, 1944, p. 629. From *Summ. Curr. Lit.*, xxv., **2**, 1945, p. 45.) The research work of the Southern Regional Laboratory is organized under seven divisions, three of which are devoted to problems of cotton lint and cotton fabrics. Another division conducts investigations on cottonseed and peanut products, whilst a fifth division concentrates on sweet-potato products. One of the remaining divisions specializes in refined analytical laboratory techniques, both physical and chemical, having application to a wide variety of substances, and the other is concerned with the development of promising processes at the pilot-plant stage. An account is given of the research work being carried out, particularly work in the textile sections depending on the application of physics, and of the equipment available for tests of a physical nature.

72. American Textile Schools: Organization for Textile Research. By M. E. Campbell. (*Amer. Dyes Rpt.*, **33**, 1944, p. 313. From *J. Text. Inst.*, Decr., 1944, A544.) Textile research in textile schools is discussed, and it is pointed out

that, although only a small proportion of the students will take up research work, a school should endeavour to acquaint all its students with the possibilities and limitations of the tools of textile research, with the most modern methods of analysing and interpreting the results of research, and with the identity, scope, and objectives of the different organizations conducting textile research. An account is given of the staff, equipment, facilities and advantages for research of the Textile School at North Carolina State College. The financing of research at a textile school is briefly discussed.

73. AMERICAN TEXTILE MACHINERY. By N. M. Mitchell. (*Text. Mnfr.*, July, 1944, p. 301.) This paper gives a brief general review of the new developments in textile machinery likely to be available after the war, and a useful alphabetical list of American manufacturers of spinning, winding, weaving, dyeing, and finishing machinery is included.

74. COTTON SPINNERS: TRAINING. By N. Woodward. (*Cotton*, U.S., **108**, 7, 1944. From *Summ. Curr. Lit.*, xxiv., **21**, 1944, p. 517.) An account is given of the experience of an American university woman in learning the work of a spinner in order to train recruits. She emphasized (1) the bad tendency of old employees to discourage learners, and hence the value of using trained instructors, (2) the difficulty of imparting the names of machine parts and spinning products, and (3) the importance of persuading operatives to take adequate meals.

75. AMERICAN COTTON OPERATIVES: EMPLOYMENT OF THREE SHIFTS. (*Text. World*, **94**, 6, 1944. From *Summ. Curr. Lit.*, xxiv., **21**, 1944, p. 517.) Several opinions on working a third shift in American mills are reported. It appears to be general practice to use the third shift as a training ground for workers who are being prepared for promotion, but it is believed in many quarters that production would not suffer if the third shift were abandoned and the first and second shifts worked more efficiently.

76. THE IMPORTANCE OF COTTON SEED IN THE DISSEMINATION OF VERTICILLIUM WILT IN CALIFORNIA. By B. A. Rudolph and G. J. Harrison. See Abs. 187.

77. GEORGIA: LABORATORY DATA AS AN AID IN INTERPRETING THE RESULTS OF COTTON AND CORN FERTILIZER EXPERIMENTS. By L. C. Olson. (*Soil Sci. Soc. Amer. Proc.*, **6**, 1941. From *Exp. Sta. Rec.*, **89**, 2, 1943, p. 180.) Laboratory studies were carried on of soil reaction, clay content, available potassium, base-exchange capacity, and exchangeable bases. The available potash in the soil prior to application of fertilizer was found to give a reliable index of the needs of the cotton plant for potash. The response from liming for cotton was found to be related to the amount of available potash in the soil.

78. TEXTILE OPERATIVES: TRAINING. By J. H. Groves and H. O. Carlton. (*Cotton*, U.S., **108**, 1944, pp. 89 and 101. From *J. Text. Inst.*, October, 1944, p. 451.) The authors describe a scheme for the training of new operatives now followed in some mills in Georgia, under the guidance of the United States War Man-power Commission and the Department of Industrial Education, Georgia School of Technology. An essential feature is detailed analysis of the job. Thus, spinning is analysed into 28 tasks and doffing into 21. Each of these is the subject of a set lesson-demonstration. The lesson about "Cleaning off the scavenger roller," for example, is shown in outline; it takes 35 minutes. A daily schedule for the first week is drawn up. That for the first day allows for four hours of general orientation (explaining the objects, the rules enforced by the management, visiting the various departments, etc.) and four hours of actual lessons. The operation of the scheme and its advantages are described.

79. THE EFFECT OF POTASH LEVEL ON SEVERAL CHARACTERS IN FOUR STRAINS OF UPLAND COTTON WHICH DIFFER IN FOLIAGE GROWTH. By J. H. Turner. Jnr. (*J. Amer. Soc. Agron.*, **36**, 8, 1944, p. 668. From *Exp. Sta. Rec.*, **92**, 2, 1945, p. 202.) When four strains of Upland cotton differing in foliage characteristics were studied at the Georgia Coastal Plain Experiment Station from 1941 to 1944, significant increases in acre yield of seed cotton were shown between 20-, 40-, and 80-lb. levels of potash (K_2O) on Tifton sandy loam. Differences found between the light-foliaged strain and the three strains of heavier foliage were highly significant. The heaviest

foliaged strain seemed to give the largest response to higher potash levels, while the lightest foliaged cotton showed a greater bloom production than the heavy-foliaged types. No definite effect of bloom production was identified with potash levels. Increases in boll size accompanied increase in potash, and differences were also found between all strains, with average boll size larger as foliage became denser. Leaf loss was lower for the higher potash levels. Light-foliaged types lost the most leaves, and differences were present between each strain, with leaf loss diminishing as foliage was denser. High bloom production was not indicative of high yields, different foliaged types showed differences in setting efficiency, and high potash levels were of benefit in setting more fruit. Strain × treatment interactions were significant for all measures of production efficiency.

80. LOUISIANA: EXPERIMENTS WITH COTTON, CORN, SORGHUM, AND SOYBEANS AT THE RICE EXPERIMENT STATION, CROWLEY. By J. M. Jenkins. (*La. Sta. Bull.* 383, 1944. From *Exp. Sta. Rec.*, **92**, 2, 1945, p. 198.) Highest average yields of lint cotton, 1938-42, were: from Dixie-Triumph 366, 549 lb.; Station Miller, 531 lb.; and Stoneville 2B, 405 lb. These varieties and Deltapine appear well adapted for the rice area. Yields of 20 of about 100 cotton varieties and strains grown 1928-42 are reported. Seed cotton yields, 1928-38, averaged highest following the application of 600 lb. per acre of 5-16-4, 5-8-8, and 7-8-4 fertilizer, respectively. Potash 48 lb. per acre, applied in a 5-12-8 mixture before planting, 1931-39, appeared enough to produce maximum cotton yields. Potash as a side dressing was less profitable than when applied before planting. Average increase in yield of seed cotton, 1933-39, was highest from plats receiving P in bonemeal, and was followed closely by cotton receiving basic slag, citratus, and superphosphate. When fertilizer was applied at rates of 150, 300, 450 and 600 lb. per acre, highest 3-year average yields of seed cotton were from the 3-10-3 formula 450 lb., and from the 6-8-6 formula 600 and 450 lb. per acre.

81. MISSISSIPPI: STUDIES WITH RECENTLY DEVELOPED COTTON STRAINS IN THE YAZOO-MISSISSIPPI DELTA, 1943. By J. W. Neely and S. G. Brain. (*Miss. Sta. Circ.* 121, 1944. From *Exp. Sta. Rec.*, **92**, 2, 1945, p. 202.) Yields of seed cotton and lint per acre, ginning percentage, bolls per pound of seed cotton, classers' staple length, and fibre measurements, including bundle strength, length uniformity, and length at the upper half mean are tabulated and discussed for 49 strains in the new strains study, 49 in miscellaneous advanced strains, and 25 Delfos advanced strains, all grown at the Delta Substation in 1943.

82. NEW MEXICO: ORGANIZATION AND OPERATION OF CO-OPERATIVE COTTON GIN ASSOCIATIONS. By R. P. Callaway. (*New Mexico Sta. Bull.* 293, 1942. From *Exp. Sta. Rec.*, **88**, 1, 1943, p. 120.) The number and the location of co-operative gins, membership and number of patrons, volume of cotton ginned, etc., are described. Analysis is made of the sources of capital, capital investment, assets and liabilities, members' equities, and of operating results from 1938 to 1941. More detailed analysis is made for the 1940-41 season of the volume of business, sources of income, expenses of ginning, relation of volume ginned to net income from ginning, and distribution of earnings.

83. NORTH CAROLINA: COTTON CULTIVATION. (*Extension Circ.* 258, 1942.) Gives suggestions for producing better staple and quality in cotton through improved production methods. The various sections of the pamphlet deal with: One variety cotton improvement; Varieties of cotton; Seed treatment; Soils; Rotation and Erosion control; Fertilizers; Cultural practices; Insect control; Harvesting, Handling, and Ginning; Classing.

84. A PRELIMINARY STUDY OF COTTON GINNING COSTS. By S. L. Clement. (*Tech. Bull. No.* 71, *N. Car. Sta. Coll. of Agr. and Eng.*, 1942. Received 1944.) The number of active gins in the State declined from 2,625 in 1914 to 824 in 1940, a decrease of 69 per cent. In the latter year North Carolina gins classified according to type of power used were: electric, 38·1 per cent.; diesel, 26·6 per cent.; gasoline, 22·9 per cent.; steam, 10·9 per cent.; water, 1·5 per cent. The average cost per bale for the 63 gins from which records were obtained was $3.16, the range being from

$2.42 to $6.54 per bale. The average costs per bale for the different items of expenses were: administration, 42 cents; ginning labour, 55 cents; repairs and upkeep, 18 cents; power and fuel, 38 cents; bagging and ties, 81 cents; and depreciation, 46 cents. The power used affected the cost per bale: up to 2,000 bales, those gins using internal combustion engines for power had a lower cost than those using other types of power.

85. Investigations in Erosion Control and Reclamation of Eroded Land at the Central Piedmont Conservation Experiment Station, Statesville, North Carolina, 1930-40, By T. L. Copley *et al.* (*U.S. Dpt. Agr., Tech. Bull.* 873, 1944. From *Exp. Sta. Rec.*, **92**, 1, 1945, p. 17.) The station was established to serve the central Piedmont problem area, extending from central Virginia to the southern South Carolina-Georgia boundary, in which the Cecil soil series comprises approximately two-thirds of the area. Cotton, corn, and tobacco are the leading crops grown in the area. Approximately one-third of the total land area is used as active cropland. Small farm units predominate, and more than one-half of the farms are operated by tenants or sharecroppers. The average annual rainfall at Statesville is 50 in. Thunderstorms are the predominant type of storms during the summer, but winter rains are usually of long duration and low intensity. A reconnaissance survey, made in 1934, showed 39 per cent, of the area to be moderately to severely eroded, and 29 per cent. more to have suffered appreciable erosion. Out of the total area damaged by erosion, 18 per cent. was affected by gullying, and 3·35 per cent. of the total land area had been abandoned because of erosion. Investigations into the causes and consequence of erosion and methods for its control were conducted on plots of various sizes, fields, and terraced and natural watersheds. Meteorological records were kept of the amount, duration, and intensity of each individual storm.

Control plot studies showed that runoff and soil losses were directly related to rainfall intensity, but the magnitude of loss was modified by such other factors as soil type, soil moisture, state of cultivation, degree and length of slope, and extent of protective cover on the soil. Runoff and soil losses under good vegetal cover composed of sod or woods were of negligible quantities throughout the period of record. Burning of woods litter increased runoff and soil losses to seriously large quantities. A 4-year rotation of cotton, corn, wheat, and lespedeza decreased the soil losses to less than one-half that of continuous cotton. Cotton in the rotation lost 70 per cent. and lespedeza but 4 per cent. as much soil as continuous cotton. The reduced soil losses from areas under crop rotations demonstrate the protective effects of crop cover and organic residue for land planted to row crops. Little difference was recorded in the runoff and soil losses from desurfaced and normal topsoil plots cropped to continuous cotton. Fertilizer applications annually, and a 2-year rotation of cotton and corn in which cowpeas were included, reduced soil losses on the desurfaced plots to approximately one-half that of continuous cotton on desurfaced soil.

86. Philadelphia Textile Institute Foundation. (*Rayon Text. Mnthly.*, **25**, 1944, p. 489. From *Summ. Curr. Lit.*, xxv., **3**, 1945, p. 71.) The Philadelphia Textile Institute, the oldest American textile school, now in its 61st year, is to appeal through the P.T.I. Foundation for a sum of two million dollars to develop research activities and for extensions to buildings and equipment. A list is given of industrialists who form the members of the Foundation and the governors of the Institute.

87. South Carolina: Some Factors affecting the Quality of Ginning Services. By J. M. Stepp and W. A. White. (*S. Car. Sta. Bull.* 344, 1942. From *Exp. Sta. Rec.*, **88**, 3, 1943, p. 402.) Gives the results of a study carried out in 1941. Data were obtained by a survey of 49 gins located in 20 counties of the State. Some of the findings were: Of 29,392 bales ginned by the 49 gins 8·4 per cent. showed a reduction of one or more grades because of gin damage. Ten per cent. of the gins accounted for 47 per cent. of the gin-damaged cotton, and one-fifth of the gins for two-thirds of the damaged cotton. A high percentage of rough ginning was done in gins operated by merchants and a low percentage in those operated by oil mills.

There was no consistent relationship between experience of gin managers and quality of ginning. Experience of the ginner and quality of ginning were related. The gins with the highest and lowest volumes of output had the lowest percentage of gin damage. In general there was a relationship between age of gin stands and quality of ginning. Gins with driers usually did the better ginning. The relationship between cleaning equipment and quality of ginning was not so obvious.

88. COTTON RESEARCH, 1943. (*56th Ann. Rpt. S.C. Exp. Sta.*, 1943. From *Exp. Sta. Rec.*, **91**, 3, 1944, p. 369.) Work in connection with cotton was concerned with cotton ginning, varietal tests, sources of nitrogen for top dressing cotton, effectiveness of reduced doses of Ceresan in the control of cotton seedling diseases; cotton breeding.

89. SOUTH CAROLINA: EFFECT OF APPLICATIONS OF SODIUM ON THE COMPOSITION AND YIELD OF COTTON AT DIFFERENT LEVELS OF POTASH FERTILIZATION. By H. P. Cooper and W. H. Garman. See Abs. 137.

90. SEED CHARACTERS AND LINT PRODUCTION: RELATION OF NAKED SEED TO LINT PERCENTAGE, LINT INDEX, STAPLE LENGTH, AND SEED INDEX IN SEA ISLAND COTTON, SOUTH CAROLINA. By J. O. Ware *et al.* See Abs. 237.

91. TENNESSEE: AMERICAN COTTON FARMERS: FINANCING. By W. S. Rowan and B. H. Luebke. (*Tennessee Sta. Agr. Econ. and Rural Sociol. Dpt. Monographs*, Nos. 136 and 137. From *J. Text. Inst.*, October, 1944, A403.) An analysis of the use of mortgage and loan forms of credit by 51 farmers in a one-crop (cotton) system of agriculture in Hardeman County, Tennessee. Nearly half the farms had less than $100 of debt. Land mortgages to buy the farms were the principal item. Commercial banks and the Federal land bank each provided nearly one-third of the money.

92. A NEW IRRIGATION SPRINKLER. By M. A. Sharp. (*Agr. Eng.*, **25**, 7, 1944, p. 252. From *Exp. Sta. Rec.*, **92**, 2, 1945, p. 275.) The author describes a device, developed in co-operation with the Tennessee Valley Authority, which has a capacity of 400 gals. per minute and is so designed as to rotate slowly and distribute water uniformly over an area 150 ft. square at 60 lb. pressure. By using two sprinklers, each having a capacity of 200 g.p.m., it is not necessary to shut off the pump while changing locations. A valve in the delivery pipe is used to shut off the water from one sprinkler while it is being moved, the other absorbing the slightly higher pressure thus produced. It takes one man about 6 min. to move a sprinkler to a new location, and for a 1-in. application they are moved every hour. Since most soils will readily absorb 1 in. of water in 30 min. when dry enough to need irrigation, one man could operate two sprinklers on a pumping unit delivering 800 g.p.m. and cover nearly two acres per hour. These sprinklers are attached to light-weight irrigation pipe couplings and can be connected to risers in a few seconds.

93. TEXAS: MECHANICAL HARVESTING OF COTTON. By H. P. Smith. (*Agr. Eng.*, **25**, 5, 1944, p. 167. From *Exp. Sta. Rec.*, **91**, 5, 1944, p. 601.) The author reports upon successful trials of both barbed-spindle pickers and strippers of a finger type. Spindle machines of two of the more prominent agricultural machinery makers are partially described, together with home-made and commercially made stripper machines. Of one of the strippers tested in harvesting a hybrid strain of cotton at Lubbock in October, 1943, the efficiency was 96·2 per cent. at 1·8 miles per hour and 93·8 per cent. at 3·4 m.p.h. For a two-row tractor-mounted cotton stripper found capable of harvesting, with an allowance of tractor costs at 60 ct. per hour, tractor operator and helper at $6 per day, and depreciation and necessary repair charges at $8 per day, at the rate of six bales a day, "the total cost would be $18.80 per day, or $3.13 per bale. The average price for snapping 2,000 lb. of cotton last year was $1.50 per 100 ($30 per bale), or $180 for the six bales. This leaves a net saving, when the machine is used, of $26.87 per bale, or $161.20 per day." No mechanical solution of the problem of separating leaf trash from the harvested cotton has been attained, but the author feels that there is much reason to hope for a solution by the herbicide method, a treatment of the plants before mechanical harvesting with a chemical causing the leaves to drop from the plants. Spinning tests of mechanically harvested and picked cotton from three varieties suitable for machine stripping or

picking showed no significant differences in the strength and appearance of the yarn among the three methods of harvesting.

94. VIRGINIA INSTITUTE OF TEXTILE TECHNOLOGY: ORGANIZATION. (*Text. World*, **94**, 5, 1944, p. 113. From *Summ. Curr. Lit.*, xxiv., **18**, 1944, p. 432.) A list is given of the officials and trustees of the new institute of Textile Technology established at Charlottesville, Virginia. The plan is to accept 15 science graduates each year and train them in textile research by seven or eight teachers who are recognized textile technologists and scientific workers. Specific researches will be undertaken for members on a " cost plus " basis. The Institute will maintain a library, and issue a monthly digest of the literature and a quarterly research bulletin.

[*Cf.* Abstr. 357, Vol. XXI. of this Review.]

COTTON IN EGYPT.

95. EGYPTIAN COTTON. (*Cotton*, M/c, 17/2/45.) According to reports, the Egyptian Ministry of Agriculture has decided to permit the growing of the Zagora variety again. Zagora is the name given to cotton produced from Ashmouni seed grown in the Delta, and for the last two or three seasons the planting of Ashmouni seed in the Delta has been prohibited as part of the official acreage control programme. In the meantime, however, some new varieties more attractive to cultivators have been developed, and it is suggested that growers may not take advantage of the permission to resume growing Zagora, but will prefer to increase the plantings of the established long-stapled variety Karnak (Giza 29) and the new Menoufi (Giza 36), both of which are popular because of their high yield. The Ministry of Agriculture has also decided to put into cultivation about 1,000 acres of a new medium-stapled type, Giza 30, which it is hoped will help to meet the demand for this class of cotton. This variety is intermediate in staple between Ashmouni and Giza 7, and combines a high yield with an attractive light-coloured high-grade lint.

96. NEW VARIETIES. (*Cotton*, M/c, 4/11/44.) A few bales of Giza 31 cotton have arrived in this country for examination. The new variety is named " Aswanli " and is said to be of similar staple to Giza 7. Reports from Egypt state that the strength of Karnak (Giza 29) has increased compared with last season, and that much interest is being shown in Menoufi (Giza 36).

97. IMPROVEMENTS IN PRODUCTION. By C. H. Brown. (*Text. Wkly.*, **32**, 1943, pp. 667, 715. From *Summ. Curr. Lit.*, xxiii., **23**, 1943, p. 606.) The writer summarizes recent trends in the production of Egyptian cotton under the headings: (1) Improvements in yield per acre, (2) Varietal changes, (3) Grade improvement, and (4) Variety deterioration.

98. SALES AND DISTRIBUTION. (*Man. Guar.*, 3/4/45.) During the 1940-41 season the British Government undertook to buy all Egyptian cotton offered to it at certain prices, and its purchases amounted to 783,571 bales; in the following season the British and the Egyptian Governments jointly bought 714,984 bales. Since then the Egyptian Government has acted alone, but it took only 32,487 bales in 1942-43 and only 1,012 bales last season, while so far this season (1944-45) it does not appear to have bought any cotton.

At present, buying in the Alexandria spot market seems to come from four sources. There is, first, the Cotton Co-ordinating Committee (established in 1943) which buys for the British Ministry of Supply, for the United States Government, sometimes for the Indian Government, and for other countries such as France and Spain which cannot import freely and which have to use the British Government as an intermediary in order to obtain freight and exchange facilities, and perhaps also credits. There are, second, the local exporters buying for countries to which exports are relatively free when shipping facilities are available. At the moment virtually the only country in this position is India, which, however, recently bought about 20,000 bales direct from the Co-ordinating Committee. Next come local and foreign investors who buy cotton as a " lock-up " or as an insurance against depreciation of money, and last, local speculators who occasionally risk a gamble on cotton prices.

Support from these four sources is not very strong, but the Egyptian Government's buying prices provide a "floor" for the market.

99. SPINNING TESTS ON LONG-STAPLE COTTONS. (*Cotton*, M/c, 7/10/44.) Spinning tests have been carried out by the Spinning Test Mill, Plant Breeding Section of the Egyptian Ministry of Agriculture, on two Egyptian varieties of cotton and three West Indian Sea Island varieties. The last mentioned comprised samples of St. Kitts, Montserrat, and Antigua, which, by Egyptian standards, were graded as "extra," while the Egyptian types were Malaki (Giza 26) and Amon (Giza 39) of a grade approximately fully good/extra. The following shows the results of the tests on the cottons when in the raw state and when spun into 120's carded yarns:

	*Fibre weight.**	*Staple length (ins.).*	*Lea product.†*
Malaki	1·21	$1\frac{11}{16}$	2,832
Amon	1·21	$1\frac{5}{8}$	2,948
St. Kitts ..	1·40	$1\frac{25}{32}$	2,580
Montserrat ..	1·38	$1\frac{3}{4}$	2,565
Antigua ..	1·40	$1\frac{3}{4}$	2,410

* In millionths of a gramme per centimetre. † Count × strength.

Length of staple is shown to be not the only factor in determining yarn strength, as the results indicate that the Sea Island types were longer in staple but heavier and coarser than the Egyptian ones, and that their strength was much lower. This is believed to be the first test which has shown Egyptian cottons to be stronger than Sea Island, and it confirms the earlier impression that the new Amon is a type of unusual importance. Among the numerous valuable characteristics are its high resistance to wilt and its high yield, which is nearly equal to that of Giza 7.

100. OILING OF EGYPTIAN COTTON. By N. T. Pavlov and V. I. Kirilov. (*Khlop. Prom.*, **10**, 1940, 9-10, 17-19. From *Summ. Curr. Lit.*, xxv., **3**, 1945, p. 49.) The oiling of cotton improves its behaviour during spinning. The results obtained with comparative tests between oiled and unoiled cotton are described. The textile oil used (in amounts of 0·29–0·34 per cent.) had a density of 0·876, a viscosity of 1·87 at 50° and a flash point of 142°.

101. THE NILE BASIN. By Dr. H. E. Hurst. (Min. Publ. Wks., Egypt., *Phys. Dept. Paper No.* 45, 1944, Govt. Press, Cairo, P.T. 40. From *Nature*, 2/12/44, p. 713.) Dr. H. E. Hurst, Director-General of the Physical Department, Ministry of Public Works, Egypt, has compiled a general non-technical account of what is known as the Nile basin and the floods of the Nile, as well as an account of the various barrages. The publication is well illustrated by one coloured and several black-and-white maps and diagrams. There is, however, no bibliography.

The Nile basin, embracing about one-tenth of the area of Africa, extends far beyond the confines of Egypt, but its most important aspects are peculiar to Egypt and the Anglo-Egyptian Sudan. A brief historical survey might perhaps have stressed how near the truth Ptolemy came regarding the sources of the Nile, though he was largely discredited until the end of the nineteenth century. The physical history of the river is sketched and Balls' hypothesis of Lake Sudd is discredited. The discovery of flint implements a few metres above the present level of the river at Khartoum is a blow to the theory of a lake which existed until a later date, when it was supposed to have overflowed to the north and joined the Bahr-el-Jebel and Blue Nile waters to the Nile. The distribution of early implements suggests that the stone people of the Nile valley probably lived in a warm and humid climate. Since that climate changed to its present character, Dr. Hurst believes that there is no evidence of periodic changes, though there are irregularities from year to year. Nor does he find any connection, which has been suggested, between sunspot activity and Nile flow or the level of Lake Victoria.

While the hydrology of the Nile is fairly well known, there is still a little uncertainty about the origin of the rainfall which causes the floods. Abyssinia provides 84 per cent. of all Nile water and 70 per cent. of flood water; but the old theory that this

water originates from the Indian Ocean monsoon seems to be fallacious. Rainfall on the east and south of the Abyssinian plateau is scanty compared with that on the west, to which, in the flood season, the winds blow across Africa from the Gulf of Guinea. It seems probable, therefore, that the flood waters irrigating Egypt originate in the Atlantic. The small contribution which the rain of the Lake Plateau makes to the Nile flow is put at about 16 per cent. of the total flow. The Blue Nile is the great feeder, but the importance for this river of Lake Tana has been exaggerated; other tributaries are more important than the one draining Tana. The waters of the White Nile are dammed up by those of the Blue Nile when the latter is in flood, and much of the White Nile water is then, as at other times also, lost by evaporation.

The author concludes with some suggestions for improving control of the river. The amount of water lost by evaporation in the Bahr-el-Jebel swamps is enormous. Possible ways of preventing this loss are either by the embankment of the Jebel and the Zeraf to prevent the spilling of water into the marshes, or the construction of a new straight channel outside the swamps into which the flow could be diverted. The loss of water on the Bahr-el-Ghazal Basin also calls for preventive measures. There is in addition the problem of constructing a dam below Lake Albert in order to use that lake as a storage reservoir. Another among the schemes touched on is the proposal for a power-station at the Aswan Barrage.

COTTON IN OTHER FOREIGN COUNTRIES.

102. Argentina: Boletin Mensual. (Min. de Agr., Junta Nac. del Algodon, Buenos Aires, Argentina, 1943-44.) *Bulletins Nos.* 104-110 contain the following among other papers in Spanish: "Cotton, the premier industry of America in war and in peace" (R. C. Jackson); "The national cotton textile industry (Argentina) in 1942" (P. A. Cavadini); "The climate in the cotton zone"; "Research work carried out at the Experiment Station at Saenz Pena in 1943"; "A new agreement signed between cotton spinners"; "Inauguration of an official 'Insectary' in the Presidency of Roque Saenz Pena (Chaco)"; "Manurial trials in the 1942-43 cotton campaign"; "The influence of genetics, climate and soil on some characteristics of cotton"; "Spontaneous combustion in cotton" (E. S. Zinny). Statistics are also included of acreage, production, prices, exports, etc.

103. Belgium: Textile Industry. (*Cotton*, M/c, 13/1/45.) Belgium's textile industry is officially reported intact and ready to resume operations as soon as raw materials are made available. There has been no damage to the machinery in the three main branches of the textile trade. Belgium has nearly 2,000,000 cotton textile spindles, half as many woollen spindles, and has one of the largest linen industries in the world. Before the war she imported very little cloth, and the bulk of her trade was with Great Britain.

104. Belgian Congo: Rapport pour les Exercices 1940 et 1941. See Abs. 149.

105. Brazilian Cotton Crop, 1944-45. (*Cotton*, M/c, 17/3/45.) According to reports from the United States the protracted drought in the Southern Hemisphere, which covered a several months' period and was relieved only by widely scattered rains, has resulted in widespread losses to grains, cotton, coffee, and wool. Brazil is said to have lost more than a third of the cotton crop due to lack of rainfall. Reports from São Paulo place the destruction at nearly 40 per cent. of the crop. It was expected that the total cotton crop of the country this year would be nearly 2,500,000 bales, but through the drought the total output may be down to 1,350,000 bales. Last year's crop in Brazil amounted to 2,200,000 bales of 478 lb. each. Several weeks ago the price of Brazilian cotton was 1·5 c. below that for American of equal quality; it is now believed that a sharp rise is due which will bring the price of Brazilian closer to that of American cotton.

106. Government Loans to Growers. (*Cotton*, M/c, 7/10/44.) According to a Reuter's message Brazilian cotton growers will, in future, put 20 per cent. of their plantations under cereals, if the President approves recommendations made by the Commission at present investigating the means of assisting cotton growers in the

country. The Commission, which is to meet under the presidency of the Minister of Finance, anticipates that the Government will grant loans for the 1944-45 crop on the basis of 90 cruzeiros for 15 kilos of raw cotton, type 5.

107. Cotton in Brazil. (*Dalgety's Ann. Wool. Rev.* 1943-44, p. 78.) Whilst cotton exports from Brazil have gradually diminished since 1941, this has proved of benefit to the economic life of the country. Before breaking off relations with the Axis countries, large quantities of Brazilian raw cotton went to Japan, enabling that country to compete successfully with Brazil in other South-American countries with textiles made from Brazilian raw materials. Now the raw cotton surplus is absorbed by the Brazilian textile manufacturing industry itself, and Brazil's textile exports have increased in the same measure as her raw cotton exports have diminished. The textile industry is now the second largest industry in the country—coffee being the first.

108. Defesa do Algodão. By L. V. F. DeMelo. (*Observador Econ. e Financ.*, **9**, 100, 1944, p. 51. From *Bibliog. of Agr.*, Dpt. Agr. U.S.A., September, 1944. Item 14673.) Discusses the importance of cotton production in the Brazilian economy, problems of the producers, and increased prices as a means of combating the rural exodus.

109. New Type of Long-Staple Brazilian Cotton. (*Cotton*, M/c, 6/1/45.) The first crop in normal conditions of a new type of long-staple cotton has been gathered in the State of Parahyba. It is the product of the miscegenation of the Moco and Pima varieties, and has been under cultivation for some time in the experimental fields of the State Government. The Moco-Parahyba, as it is commonly called, yields fibres of an average length of more than 34 mm., practically double the results obtained in the cultivation of the parent strain, Moco. The new strain has awakened wide interest in the textile circles of the country, where its qualities as to density, whiteness, resistance, and fineness are much appreciated.

110. O Comportamento de Linhagens de Algodão Delfos e Stoneville em Ribeirao Preto. By I. Ramos and M. V. de Morais. (*Bragantia*, **3**, 12, p. 553, Campinas, Brazil, 1943.) *English summary.*—The yield of cotton strains from Delfos 719 and Stoneville 2B was compared in trials with the commercial variety I.A.7387 (control) at the Ribeirao Preto Agricultural Experiment Station for five consecutive years, 1937-38 to 1941-42. The annual yield varied considerably during these years; low yields predominated. The number of bolls formed was found to be correlated to quantity of rain and its distribution during flowering time. Too much rain lowered the yield, probably on account of the increase of shedding. In 1937-38 a bulk of several strains of Delfos surpassed statistically the control by 18 per cent. In the four subsequent years strains of Delfos and Stoneville 2B, isolated in 1937-38, proved to be far superior to I.A.7387. All strains of Stoneville 2B and eight strains of Delfos showed less variation in production than I.A.7387, indicating that they are less influenced by the environmental factors. The best strain of Delfos, 38/1418, surpassed I.A.7387 in yield during four years' trial, averaging 1,348 lb. seed cotton per acre against 1,046 lb., or 28·9 per cent. above the control. Among the Stoneville 2B strains, the strain 38/1709 proved to be the best; its yield was superior to that of the control in three out of four years. During four years the average yield of this strain was 1,262 lb. of seed cotton per acre, or 20·6 per cent. above the control. Delfos strain 38/1418 and Stoneville 38/1709 could be used in the improvement of cotton production in the district of Ribeirao Preto.

The paper is furnished with illustrations and graphs, and a bibliography of 23 names is included.

111. China: The Textile Industry. (*Cotton*, M/c, 13/1/45.) According to reports the recent visits to China of Mr. Donald Nelson, former Chairman of the U.S. War Production Board, have led to the establishment in China of a War Production Board modelled on the experience of the American one, which has taken charge of the entire industrial output of Free China. According to a statement by Dr. Wong Wen-hao, the Minister of Economics, who is Chairman of the China War Production Board, it is the aim of the new organization to secure an improvement in manufacturing processes in order to improve efficiency and to increase production. The

strengthening of China's textile industry is needed not only for the prosecution of the war but also for relief and the revival of post-war trade. In its report to U.N.R.R.A. the Chinese Government stressed that 84,000,000 Chinese war victims will require relief, and that the minimum requirements will need some 840,000 tons of cotton cloth, which will be difficult to obtain unless domestic production is able to meet at least a substantial proportion.

112. PLANNING THE POST-WAR TEXTILE INDUSTRY. (*Cott. Tr. J.* From *Ind. Text. J.*, August, 1944, p. 446.) It is stated that there were few modern textile mills in the interior of China prior to 1937, but since that year a considerable number of factories have been transferred from the war regions to the south and west sections of the country. There are now between 300 and 400 mills in the interior. Most of the textile plants are engaged on army contracts, and have made a very considerable contribution to war supplies.

113. CHINESE TEXTILE INDUSTRIES: RECONSTRUCTION. By Cha Chi-Min. (*Text. World*, **94**, 6, 1944, pp. 85, 182. From *Summ. Curr. Lit.*, xxiv., **21**, 1944, p. 517.) In 1937 the Chinese textile industry had five million spindles, 100,000 looms, and bleaching, dyeing, printing, finishing and knitting plant, all of modern types. About 60 per cent. of the spinning and weaving was under the sole control of Chinese people and the rest was almost all in Japanese hands. About 90 per cent. of the industry is now destroyed. Future prospects are reviewed, and a Five-Year Plan for rebuilding the industry with the help of American plant and money is discussed.

114. ETHIOPIA: PROSPECTS OF TRADE AND INDUSTRY. By A. D. Bethell. (*E. Afr. and Rhod.*, 2/11/44, p. 196.) *Cotton.*—Cotton is now fetching 3s. a kilo unginned in Addis Ababa. The cotton produced by the Italians was of good quality and long staple. Nine hundred tons of it were exported to Italy in 1938. The objections to cotton are that it grows best in malarial areas and needs large bodies of casual labour for picking. Local consumption alone might be insufficient to justify large-scale production, but Ethiopia is not bound by existing export quotas, and the other difficulties can be overcome.

115. JAPANESE COTTON INDUSTRY: DEVELOPMENT. (*Text. Rec.*, **61**, July, 1944, p. 40. From *J. Text. Inst.*, November, 1944, A495.) The writer discusses the present position and future ambitions of the Japanese cotton industry, and quotes recent statistics of wages and production. In 1936 average wages for all male factory workers were 33·8 pence and for females 10·3 pence per day of 9¾ hours, and in the cotton industry about four-fifths of the operatives were females, with a large proportion under 16 years of age. Three firms handled 80 per cent. of the raw cotton.

116. THE IMPROVEMENT OF THE NATIVE COTTON OF MANCHURIA. By S. Nakatomi. (*Pl. Bre. News*, **9**, 1934. From *Pl. Bre. Abs.*, xiv., **3**, 1944, p. 227.) Three selected strains obtained from a cross between a Manchurian cotton and a variety from southern China are illustrated. They mature early like the native cotton, which they surpass in ginning percentage and staple length.

117. A NEW VARIETY OF UPLAND COTTON ADAPTABLE TO SOUTHERN MANCHURIA, KANNÔ NO. 1. By S. Nakatomi. (*Pl. Bre. News*, **9**, 1934. From *Pl. Bre. Abs.*, xiv., **3**, 1944, p. 226.) By line selection of an early maturing Upland cotton, King's Improved, at Kantô-syu Agricultural Experiment Station, the new line, Upland Cotton Kannô No. 1, was obtained. It matures earlier and is more productive than the parent type. It was thought most promising in Southern Manchuria.

118. THE FERTILITY OF AN INTERSPECIFIC HYBRID OF COTTON. By S. Nakatomi. See Abs. 216.

119. PERUVIAN COTTON. (*Cotton*, M/c, 3/3/45.) Advices from Lima, dated January 11, 1945, state that the major part of the 1944 cotton crop has now been disposed of. Some 30,000 tons of cotton for account of the British Ministry of Supply are lying in Peruvian ports awaiting shipment to the United Kingdom.

120. PERU: CULTIVOS DEL ALGODON SEA ISLAND. By J. E. Wille and G. Garcia Rada. (*Dir. Gen. de Agr. B* 16, 1943. Item 21145. *Bibliog. Agr.* U.S. Dpt. Agr., November, 1944.) Deals with the diseases and pests of Sea Island cotton in the valleys of Cañete, Chincha, Pisco, Ica, and Nazca.

121. Algunos Aspectos del Cultivo del Algodonero en los Valles de Chincha, Pisco, Ica y Nazca en la Campana 1943-44. By T. Boza Barducci. (*Informe No.* 56, Lima, Peru, 1944.) Discusses some aspects of the cultivation of cotton in the valleys of Chincha, Pisco, Ica and Nazca in the 1943-44 campaign, and the plan for the organization of "official seed nurseries" for Tanguis cotton in those valleys following on the very good results obtained with the selection LM. No. 7-35.

122. Memoria de la Estacion Experimental Agricola de la Molina Correspondiente el Ano 1941. Cotton Pests. By J. E. Wille. See Abs. 156.

123. Cotton Insects in Peru. By F. F. Bibby. See Abs. 155.

124. Cotton Spinning and Weaving Mills to be Established in the Portuguese Colonies of Angola and Mozambique. (*Cotton,* M/c, 24/2/45.) According to reports a company has been formed for the establishment of cotton spinning and weaving mills in Angola and in Mozambique. It is stated that most of the machinery will be bought in the United Kingdom if satisfactory delivery dates can be arranged, and that the intention is to use the lower qualities of the local cotton crops and to produce only coarse plain goods. Bleaching, printing, and dyeing will not be undertaken, at least for the present, and sales will be restricted mainly to the mills' home markets.

125. Costos e Ingresos de Algodon Sea Island en la Costa Noroeste de Puerto Rico, 1939 y 1940. By L. M. Geigel. (*Puerto Rico Univ. Sta. Bull.* 61, 1942. From *Exp. Sta. Rec.*, **89**, 4, 1943, p. 494.) Information from 140 (476 cuerdas) Sea Island cotton plantings in 1939 and 210 plantings (617 cuerdas) in 1940 was obtained. Analysis is made of the costs of production and the variations in and the factors affecting such costs and returns. Share-croppers planted 62 per cent. of the crop in 1939 and 71 per cent. in 1940. The average yields of seed cotton per cuerda (0·97 acre) and the average price of the seed per pound were 498 lb. and 8·7 ct. in 1939 and 674 lb. and 9·1 ct. in 1940. The average costs of production per cuerda and per quintal were $29.67 and $5.96 in 1939 and $37.21 and $5.53 in 1940. The net returns were $13.68 and $2.74 in 1939 and $24.29 and $3.59 in 1940. Growing costs per cuerda were about the same on soils of high, low, or medium productivity. Tenure had no material effect on net returns. The farmers making the highest returns had yields above 700 lb. of seed cotton per cuerda, applied more than 400 lb. of fertilizer per cuerda, harvested over 95 per cent. of first-class cotton, cultivated relatively small- to medium-sized plantings, and used from 120 to 160 hr. of labour in growing operations on the soils of high productivity and 120 hr. on the medium and poor soils.

126. U.S.S.R. Cotton in the Uzbek Republic, 1944. (*Cotton,* M/c, 3/2/45.) From an article by Victor Belikov received by *Cotton* from the Assistant Editor of the Press Dept. of the Soviet Embassy, London, we learn that the Uzbek Republic, the chief cotton-growing region in the Soviet Union, has fulfilled a programme of cotton sales to the Government, and has delivered nearly 19,000,000 poods (pood= 36 lb.) more than in the previous year. In 1944 the average cotton yield increased 4 centners per hectare over that of 1943. This entailed hard work, but labour was better organized and machinery utilized more efficiently. Machine and tractor stations trained and gave refresher courses to 14,000 tractor drivers. Considerable attention was also paid to the timely repair of tractor parts, and resulted in an increased performance per tractor of 25 per cent. Prospects for the crop in the spring were not favourable; lack of rain retarded the growth and many seedlings perished. Collective farms, however, had grown emergency stock seedlings under glass, and these were planted out individually to replace the dead seedlings. When the crop was thinned the thinnings were also planted out where rows were sparse. This entailed an enormous amount of work, which the Uzbeks performed with credit. Throughout the growth period the crops were thoroughly hoed, sometimes as much as six times during the season, and irrigated and manured. Before the war an average of 250 lb. mineral fertilizer was applied per hectare, but this year, owing to war demands on the fertilizer industry, the cotton fields received only 18 lb. mineral fertilizer per hectare. This was added to by every cotton grower, when going to the

fields in the morning and after dinner, bringing with him a sack of animal manure, humus, or rubble of decrepit adobe structures which make excellent fertilizers, and resulted in the cotton fields this year receiving an average of 18 tons of organic fertilizer per hectare. Uzbek cotton growers have resolved to increase their cotton crop next year by another two or three centners, and the fight has already begun.

127. Science in the U.S.S.R. By A. Fersman. (*Advan. Sci.*, **3**, 9, 1944, p. 62. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 1.) A comprehensive review is given of the present position of science in the U.S.S.R. After a brief historical introduction, the principles governing scientific research are described. The philosophical basis of science is held to be dialectical materialism as developed by Marx and Lenin, with a special emphasis on the Hegelian notion of historical process as the outcome of the conflict of antinomies. Causality is accepted as a fundamental and necessary tenet of materialism. Systematization and the reduction of scientific law to mathematical terms are regarded as among the more important scientific procedures. In the realm of biology, Darwinism is once again upheld as the fundamental doctrine, but it should be realized that the author's use of this term, following the schools of thought founded by Michurin and Lysenko, does not conform to the usage outside of the U.S.S.R. Consideration is then given to the application of science, this being regarded as its primary purpose. Questions of organization and the integration of different branches of science are discussed and the need for popularizing scientific views is stressed. Scientific development is believed to be related essentially to the State and the reciprocal influence of the two is touched upon.

SOILS, SOIL EROSION AND MANURES.

128. Good Soil. By S. Graham Brade-Birks. (Teach Yourself Farming Series.) (Bickley: English Universities Press, Ltd., 1944, 3s. net. From *Nature*, 11/11/44, p. 594.) Somewhat more academic than are other volumes in this series, this book covers a good deal of ground in small compass, and presents an invaluable introduction to soil science—though possibly the section on cartography could have been fuller. The book is especially notable as making accessible the details of Dr. Linwood L. Lee's New Jersey method of recognizing textural groups by handling the soil, for its numerous and instructive illustrations, and for its useful outline of soil mineralogy. The book pays special attention to soil texture, describes world soil groups (" the soil-pattern of the world "), and has a practical chapter on finding the best crop for every soil under English conditions. It can be cordially recommended to biologists and non-biologists as a clear exposition of a subject about which few books exist.

129. Soil Fertility Experiments in South Africa. See Abs. 42.

130. Studies in Soil Dispersion. 1. Dispersion of Soils by Mechanical Methods. By A. N. Puri. (*Ind. J. Agr. Sci.*, February, 1944, p. 64.) Of the purely mechanical methods of dispersing soils, shaking for 24 hours with coarse sand is the most effective. The diameter of sand particles is one to two millimetres and the amount used is five times the weight of soil.

131. Base Saturation and *p*H in Relation to Liming and Nutrient Conservation of Soil. By A. Mehlich. (*Soil Sci. Soc. Amer., Proc.*, 7, 1942, p. 353. From *Exp. Sta. Rec.*, **91**, 5, 1944, p. 514.) The quantities of magnesium and potassium lost from the surface of sandy soils in the field decreased with increasing base saturation. These nutrients were not retained by the acid subsoils, irrespective of the base exchange capacity. Increasing the percentage base saturation of the subsoil increased the retention of potassium and magnesium. In percolators, increasing the base saturation of subsoils by liming increased the retentive power for potassium and magnesium, favoured root penetration, increased moisture utilization, and increased plant growth. By increasing the base saturation of the subsoil, the losses of ammonia and nitrate nitrogen were at first increased; however, they were lost in greater amounts from the more acid subsoils after the roots had been thoroughly distributed.

It is concluded that liming the surface is an inefficient method for correcting the acidity of the subsoil, hence inefficient in the conservation of plant nutrients.

132. Three Decades with Soil Fungi. By S. A. Waksman. (*Soil Sci.*, **58**, 2, 1944, p. 89. From *Exp. Sta. Rec.*, **92**, 1, 1945, p. 20.) The author reviews 30 years of the work of the department of soil microbiology of the New Jersey Experiment Station, beginning with his own first experiments to ascertain whether or not fungi are capable of growing, and produce a mycelium in a normal soil. Under the head of Problems Considered—a caption which covers the principal content of the review—the following topics are discussed: Do fungi produce vegetative mycelium in the soil?; enumeration of fungi in the soil; nature of the fungus population of the soil; biochemical activities of fungi and their bearing upon soil processes; associative and antagonistic effects of soil fungi; fungus population of the soil in relation to growth of higher plants; miscellaneous problems on the occurrence and activities of fungi; and the rôle of fungi in soil processes and in plant nutrition.

133. Erosion. By Sir A. Tottenham. (*Ind. Frmg.*, March, 1944, p. 105.) A brief illustrated account of the serious damage caused by erosion in Pudukkottai State, South India, and the measures taken to check it.

134. Soil Erosion and Soil Conservation in the Colonial Empire. By H. A. Tempany, G. M. Roddan, and L. Lord. (*Emp. J. Exp. Agr.*, July, 1944, p. 121.) In this paper the story of soil erosion and soil conservation in the British Colonies is brought up to date. Although soil erosion remains one of the chief agricultural problems with which the Colonial Empire is faced, it is a striking fact that notwithstanding war conditions there has been a marked gain in popular appreciation of the serious nature of the position, coupled with appreciable advances in the devising and application of soil-conservation measures. Nothing approaching a satisfactory solution of the problem has yet been achieved, but the fact that so much advance has been capable of attainment in the midst of anxieties and preoccupations of war holds out hope that with the return of peace the way may be open for achievements on a larger scale. An important factor has been the provision of funds from the Imperial Treasury through the Colonial Development and Welfare Fund for carrying out soil-conservation measures; equally important has been the tendency towards improved collaboration between the various agencies of Government concerned with the different aspects of the question, and the growing measure of popular support for policies directed towards soil conservation.

The most widely prevalent form of erosion in the Colonial Empire is sheet erosion, but in places extensive gullying also occurs, whilst in drier areas wind erosion is a serious menace. The chief contributory causes have been excessive deforestation, cultivation of lands which by reason of their steep slope should not have been opened for cultivation at all, unsuitable methods of cultivation, lack of provision for dealing with surplus run-off, the growth of crops conducive to erosion without adequate cultural safeguards, lack of protection from wind, and excessive concentrations of livestock, especially during dry periods, leading to overtrampling and consequent soil loss. The most severe cases of damage from erosion have occurred in the East African Dependencies and in the High Commission Territories of South Africa. In West Africa the position is considered to be somewhat less serious, although in certain areas, notably in the Northern Territories of the Gold Coast, parts of the northern and eastern provinces of Nigeria and parts of Sierra Leone, sheet erosion with some gullying is extensive. In the West Indies the position varies greatly, but erosion is very serious in some of the more mountainous regions of these island dependencies. Erosion is also extremely serious in parts of Palestine and Cyprus.

The measures adopted to counteract erosion naturally vary to some extent according to conditions; they may be classified as follows: (*a*) agricultural, (*b*) forestry, and (c) engineering. Under (*a*) are comprised contour ploughing and planting, rotational strip-cropping, the use of grass strips and live wash-stops, the making of contour drains and wash-stops, the planting of wind-breaks to check wind erosion, restriction on the cultivation of those crops specially conducive to erosion,

the use of cover crops and mulches, the control of grass- and bush-burning, and the improvement of pastures, combined with the introduction of rotational grazing and, where necessary, the reduction of stock. Under (*b*) are comprised the establishment of forest reserves and the closure to cultivation of threatened areas coupled with their reafforestation; such areas may include hill-tops, steeply sloping lands, gullies, and river catchment areas. An ancillary activity is the establishment of plantations of suitable trees for the provision of fuel and timber supplies for the use of populations. Under (*c*) are comprised the construction of contour bunds and terraces, the construction of stops and dams for the checking of gully erosion, and the construction of works to deal with excessive run-off, as well as the maintenance of roadside drainage, neglect of which is often a source of gullying. With this is combined the provision of additional water-supplies for livestock and human consumption, thereby reducing excessive concentrations of livestock during dry seasons and preventing over-trampling and erosion; and the reclamation of swampy areas by drainage, thereby increasing the land area available for cultivation in situations least liable to erosion. In addition the removal of part of the population in densely populated areas and their resettlement in other localities where land is more plentiful may be undertaken. Experience tends to show that so far as is practicable it is good policy to reduce to a minimum any works for the direct control of erosion which have the character of major engineering operations, and to replace them wherever possible by operations carried out by the cultivators themselves, since it has been found that where such works are carried out by direct government agency in the first instance it is difficult to arouse the interest of native cultivators and to induce them to assume responsibility for their subsequent maintenance.

The paper concludes with short accounts of the state of erosion and of the counter-measures being taken in the East African Dependencies, the High Commission Territories of South Africa, West Africa, the Eastern Dependencies, Mediterranean Dependencies, West Indies and America, and Dependencies in the Western Pacific. Some good illustrations are included.

135. Investigations in Erosion Control, and Reclamation of Eroded Land at the Central Piedmont Conservation Experiment Station, Statesville, North Carolina. By T. L. Copley *et al.* See Abs. 85.

136. A Study of the Fertilizing Value of the Silts carried in Suspension by the Rivers of the Punjab. By R. C. Hoon and C. L. Dhawan. See Abs. 22.

137. South Carolina: Effect of Applications of Sodium on the Composition and Yield of Cotton at Different Levels of Potash Fertilization. By H. P. Cooper and W. H. Garman. (*Soil Sci. Soc. Amer. Proc.*, **7**, 1942, p. 331. From *Exp. Sta. Rec.*, **91**, 5, 1944, p. 517.) The authors report experiments indicating that at all levels of K_2O fertilization the plats receiving Na produced considerably more seed cotton per acre than those not receiving Na. The percentage increase in yields of the Na plats over the corresponding no-Na plats decreased with increasing K fertilization. The initial 15 lb. of K_2O produced the greatest individual increase, averaging 422 and 436 lb. per acre, respectively, on the plats with and without added Na. The results are said to suggest that with heavy applications of K little or no increase in yields would be secured from additions of Na. An application of 30 lb. or more of K_2O per acre maintains or increases the yields of cotton on the soils used. On the plats receiving no K and those receiving 15 lb. of K_2O there were decided decreases in yields. On the plats receiving KCl and NaCl, singly or in combination, Na increased the yields of seed cotton, particularly at the lower potassium application levels. Where no K was used the addition of 40 lb. of Na_2O produced a 20 per cent. increase in yields. Where no K was used and the crop was side dressed with $NaNO_3$ there was a 40 per cent. increase in yields. The average Na content was from 471 to 883 per cent. higher in the cotton plants grown on the plats receiving Na as the nitrate than in those grown without Na. Increasing the rate of K fertilization did not appreciably affect the net absorption of Na. The average milliequivalent ratio of Ca : K+Na was greater in the plants grown without added Na.

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, GINNING, ETC.

138. Statistical Methods for Research Workers. By R. A. Fisher. (Biological Monographs and Manuals, No. 5.) (9th Edn., Oliver and Boyd, Ltd., London and Edinburgh, 1944. 16s. net.) The ninth edition of this now standard work, which has exercised, and must continue to exercise, its influence on research methods, especially in biology. It is justly recognized as an essential part of all biological libraries and research laboratories.

139. The Methods of Statistics. By L. H. C. Tippett. (Williams and Norgate, Ltd., London, 1941. 3rd Ed., 17s. 6d. Reviewed *Pl. Bre. Abs.*, xv., **1**, 1945, p. 87.) This excellent introduction to statistics achieves the difficult task of being popular in style while having sufficient mathematics to make the development coherent. The early chapters are devoted to some of the necessary fundamental ideas, together with notes on significance testing and maximum likelihood. After discussions on χ^2 and Student's "*t*" an account is given of the analysis of variance, which continues in one form or another to the end of the book. A mathematician, having read this book, would be able to tackle many contemporary papers on statistics, but whether mathematician or not, the reader's outlook might be biased on some matters. Thus, he would have no idea of the sample space of Neyman and Pearson, and of its relevance to the general theory of significance testing, and he would have no idea of sequential analysis. Of course, the treatment is only introductory, but it is worth while indicating the theoretical value of the tests given. Statistics is an actively developing subject, and useful research is being done in some of its simplest sections. Certain specific points deserve mention. The L_1 test for the homogeneity of a set of estimates of variance has given place to the Bartlett test, which uses the χ^2 tables. Many examples are quoted on the testing of different hypotheses in regression, and it seems worth while pointing out that all these tests arise from the same principle. In testing the significance of a particular effect of value, we are really testing the change which occurs when the condition is relaxed. Thus, the effect may be that of linear regression. Then, by imposing the condition, we stipulate that the true regression takes a particular value: by relaxing it, we allow it to take its sample value. Let S be the sum of squares of residuals when the condition is imposed, and S^1 be the sum of squares of residuals when the condition is relaxed; let S have degrees of freedom n, and S^1 have degrees of freedom n^1. We then test $(S\text{-}S^1)/(n\text{-}n^1)$ with $(n\text{-}n^1)$ degrees of freedom against S/n with n degrees of freedom. If this ratio is significant, then so also is the effect. Section 10.31 is particularly difficult. It might have been preferable to have used the generalized factorial analysis of variance, or alternatively suitable linear hypotheses with the principle of least squares. In particular, a first order interaction is more easily conceived as the variance associated with the residual sum of squares in a two-factor analysis when the main effects have been removed: for one thing, this concept is capable of immediate generalization.

140. Statistical Definition of Standard Yield of Crops. By P. C. Mahalanobis. (*Sankhya: Ind. J. Stat.*, **6**, 1942, p. 97. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 1.) A short general discussion of the object of crop experiments is presented. Since the yields on two different plots will not have a constant ratio under varying seasonal conditions, it is necessary to find the number, size, and geographical distribution of plots which will give the greatest information with a limited total expenditure. Such an arrangement is usually found only after a number of trials.

141. A Further Note on the Estimation of Crop Yields. By V. G. Panse and R. J. Kalamkar. (*Curr. Sci.*, **13**, 223, 1944.) Describes the sampling of cotton crops for yield estimation in the Akola and Buldana districts of the Central Provinces, India, and discusses the efficiency of yield estimation in the cotton crop. Concludes that sampling to give a yield estimate with a standard error between 2 per cent. and 3 per cent. is manageable.

142. A Statistical Study of Flower Production in Cotton. By D. N. Nanda *et al.* (*Ind. J. Agr. Sci.*, February, 1944, p. 78.) An attempt has been made to find

out a mathematical expression for the flowering curves of four varieties of cotton grown at Lyallpur. It was found that the logistic equation of the third degree, viz.:

$$\text{Log}\frac{x}{a-x}=A+Bt+Ct^2+Dt^3$$

gave the best fit for the rate of flower production. The average trend of flower production for a large number of years was also found to be significant to the third degree. The relative rate of flower production was found to be a function of time, although Prescott (1922) working on Egyptian cotton found it to be constant. The relative rate of flower production was higher for the indigenous variety, 39 Mollisoni, than for all the acclimatized Punjab-American varieties. A comparison of the relative rate of growth in height and flower production showed that whenever the rate of growth was higher in any particular variety than in another in any one year, the rate of flower production was also higher in the former. In one variety, however, if the rate of growth was higher in any one year, the rate of flower production was low.

143. South Africa: Efficiency of Design in Field Experiment at Potchefstroom. By A. R. Saunders. (*Emp. J. Exp. Agr.*, July, 1944, p. 157.) Data are presented on the efficiency of lattice, balanced-lattice, lattice-square, balanced incomplete-block, and split-plot designs. Lattice designs gave an average increase in efficiency of 29 per cent., balanced lattices 52 per cent., lattice squares 134 per cent., and balanced incomplete blocks 37 per cent., with recovery of inter-block information. Split-plot arrangements resulted in a considerable loss of information on main-plot comparisons and an appreciable gain on sub-plot comparisons.

144. The Recovery of Inter-Block Information in Quasi-Factorial Designs with Incomplete Data. 2. Lattice Squares. By E. A. Cornish. (*Bull. Coun. Sci. Industr. Res. Aust.*, No. 175, 1944. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 1.) An approximate method is described for recovering information from quasi-factorial designs in which the data are incomplete.

[*Cf.* Abstr. 141, Vol. XIX. of this Review.]

145. Depth and Method of Soil Preparation and Cultivation for Corn and Cotton. By C. A. Mooers. (*Tennessee Sta. Bull.* 191, 1944. From *Exp. Sta. Rec.*, **91**, 6, 1944, p. 677.) Cotton under level culture produced as large crops where land was ploughed 3 in. deep as with 6 in. ploughing on both poor and rich Lintonia loam in west Tennessee. Where land was bedded but not flat-broken, the yields were favourable to 6 in. bedding. Ploughing preparatory to bedding was profitable on rich land but distinctly unprofitable on poor land. Early ploughing was notably superior under level planting, and early ploughing and early bedding gave appreciably better yields at both 3 in. and 6 in. preparation depths. Good cultivation on poor land resulted in yields averaging nearly 30 per cent. larger than were obtained under no cultivation, while on rich land yields averaged the same from both practices.

146. Plowman's Folly. By E. W. Faulkner. (*Trop. Agr.*, August, 1944, p. 141.) The book constitutes perhaps the most serious challenge to agricultural theory that has been advanced in recent years; its teachings may well alter the established practice of land cultivation, for it claims to prove that the traditional mouldboard plough seriously injures the soil and is the least satisfactory implement for the production of crops that has yet been proposed. The main charge which the author lays against the mouldboard plough is that the act of soil inversion places crop residues and green manures, and all else added as amendments to the soil surface, below the reach of the roots of the crop that is being grown.

PESTS, DISEASES, AND INJURIES, AND THEIR CONTROL.

147. Insecticides: Application. By R. C. Roark. (*Chem. and Eng. News*, **22**, 1944, p. 1464. From *Summ Curr. Lit.*, xxv., **2**, 1945, p. 32.) A broad discussion of the supply and consumption of insecticides and fungicides in the United States; substitutes for copper and arsenic compounds, rotenone and pyrethrum; the pos-

sibilities and uses of fluorine compounds, nicotine compounds, organic fumigants, synthetic contact insecticides, D.D.T. [2 : 2-bis (*p*-chlorophenyl) 1 : 1 : 1-trichloroethane], and Eulans and other moth-proofing agents; the use of synthetic organic compounds as substitutes for lead arsenate; the synergism of insecticides, organic fungicides, and new methods of applying insecticides.

148. A Remarkable New Insecticide. (*E. Afr. and Rhod.*, 15/3/45, p. 658.) Dr. Ronald Slade, of the research staff of Imperial Chemical Industries, stated in a recent address to the Liverpool Branch of the Society of Chemical Industry that a new British discovery named Gammexane had proved more toxic to many insect pests than any other insecticide. There was one biological laboratory in this country at which locusts were kept, and before the toxicity of Gammexane to locusts had been realized, a small quantity of dust containing the crude material had been sieved on to a bench on one side of a room containing cages of locusts. All promptly died. After the cages had been thoroughly scrubbed, the floors washed, and the walls vacuum-cleaned, fresh locusts placed in the cages likewise died. Only after the room had been completely redecorated could breeding of the locusts be resumed. Gammexane was also fatal to mosquitoes and other vermin, and more toxic to weevils than any substance previously known. The insecticide was found as a result of experiments lasting five years.

149. Belgian Congo: Rapport pour les Exercices 1940 et 1941. (*Publ. Inst. Nat. Etud. Agron. Congo Belge,* 1943. From *Rev. App. Mycol.*, xxiii., **11**, 1944, p. 431.) The following are among the items of phytopathological interest in this report: R. Steyaert's studies on the resistance of different cotton selections to stigmatomycosis (*Nematospora coryli* and *Ashbya* (*N.*) *gossypii*) were continued, 3,170 bolls having been inoculated in 1940 and 600 in 1941. Strains 145-116 and 145-84 of selection 145-C-55 appeared to be the most resistant to the disease, but notwithstanding this advantage they yielded only second-grade cotton in commercial plantings, due to the premature opening of the bolls giving ingress to saprophytes which impaired the fibre. (*Cf.* Abstr. 713, Vol. XVI. of this Review.)

Soil inoculation experiments with rice cultures of *Fusarium vasinfectum* were carried out with a view to the development of wilt-resistant cotton strains. Since the material available for this purpose consisted of the old, genetically pure lines at Bambesa, the likelihood of success appeared to be remote, but in 1940 a plant, A6, believed to be a derivative of 270, exhibited a noteworthy degree of resistance, which descended to its progeny in 1941. A practical interest attaches to the isolation of the toxin or toxins of *F. vasinfectum,* which may be used in preliminary laboratory work to eliminate seedlings unsuitable for further large-scale trials. The crude extract was found to be useless for the purpose in view and a purified crystalline preparation was finally obtained which proved to be highly toxic to the cotton seedlings.

Work on Pests and Diseases. (*Rev. App. Ent.*, xxxii., Ser. A, 12, 1944, p. 416.) *Platyedra gossypiella,* Saund., was injurious to cotton in several districts in the vicinity of the Bambesa Experiment Station in 1941. The Braconid parasite, *Chelonus* (*Chelonella*) *ritchiei,* Wlkn., introduced against it was recovered from one site. *Tribolium castaneum,* Hbst., injured stored cottonseed oil-cake, and the use of light traps was recommended against it. In experiments at Gandajika, the number of punctures per boll by *Dysdercus fasciatus,* Sign., was smallest on a variety of cotton that had bolls with rough outside walls covered with resin glands, and greatest on the bolls with the thinnest walls. The incidence of boll rots appeared to be directly correlated with the number of punctures.

150. Tests Conducted by the U.S. Bureau of Entomology and Plant Quarantine to Appraise the Usefulness of DDT as an Insecticide. By P. N. Annand *et al.* (*J. Econ. Ent.*, **37**, 1, 1944, p. 125. From *Rev. App. Ent.*, xxxii., Ser. A, **11**, 1944, p. 376.) Tests with DDT on the More Important Cotton Insects. By E. E. Ivy. In cage tests in Texas in 1943, a dust of 2 per cent. DDT in pyrophyllite, used at the rate of 32 lb. per acre, caused an average mortality of 96 per cent. of third-instar larvæ of *Heliothis armigera,* Hb., on cotton, as compared with 86, 77 and 62 per cent. for mixtures of sulphur with equal quantities of basic copper arsenate,

cryolite (92·1 per cent. sodium fluoaluminate) and calcium arsenate, all applied at 16 lb. per acre. In other tests, the DDT dust gave 97, 82 and 63 per cent. mortality at 32, 16 and 8 lb. per acre, respectively. DDT acts on *H. armigera* both as a stomach and a contact poison, but the latter effect is believed to be the more important. Exposure for 30 seconds to dust clouds of this material resulted in 40, 90 and 100 per cent. mortality of fifth, fourth and third instars. Larvæ in the third instar were killed in 10 minutes, and those in fourth and fifth instars in 100 minutes when put on blotting paper that had been dusted at the rate of 32 lb. per acre. Larvæ fed on a dusted leaf sandwich consumed a lethal dose after exposure for 2-4 days. A water suspension of the dust of DDT and pyrophyllite killed the larvæ when placed on the dorsum with a pipette; the median lethal dose of DDT for 240 larvæ in the fifth instar was 0·299 mg. per gm. body weight. The same dust was comparatively ineffective against *Alabama argillacea*, Hb. (35·5 per cent. kill) and *Anthonomus grandis*, Boh. (18·5 per cent.), when applied at the rate of 32 lb. per acre, and had little effect on *Aphis gossypii*, Glov. (15·4 per cent. mortality), in laboratory tests in which nicotine dusts (2 per cent.) gave 81 per cent. mortality.

TESTS WITH DDT AGAINST PENTATOMIDS, MIRIDS, THE BOLLWORM, AND THE COTTON APHID. By W. A. Stevenson *et al.* In field-cage tests in Arizona in 1943, a dust of DDT in pyrophyllite (2 per cent.) killed 50 and 10 per cent. respectively of the Pentatomids, *Euschistus impictiventris*, Stal, and *Chlorochroa sayi*, Stal, and 100 per cent. of the Capsids, *Creontiades femoralis*, Van D., and species of *Lygus*, on cotton plants, in 24 hours; 73 and 83 per cent. of the Pentatomids were dead in 48 hours and all in 96 hours. Some plants were wet with rain when dusted, but no injury was caused. In similar tests, mortality of *Heliothis armigera*, Hb., was complete in 46 hours in one cage and very poor in the other. In a small plot of cotton dusted on August 26, when the temperature was 87° F., the DDT dust and a dust containing 2 per cent. free nicotine gave 41 and 76 per cent. mortality of *Aphis gossypii*, Glov., in 48 hours. Similar treatments on September 3, when the temperature was 82° F., gave 5 and 86 per cent. mortality, respectively.

DDT FOR CONTROL OF THRIPS ON COTTON. By I. Shiller and C. A. Richmond. In preliminary tests in Texas in 1943, young cotton plants heavily infested with *Thrips tabaci*, Lind., and *Frankliniella fusca*, Hinds, of which the former predominated, were given one application of a pyrophyllite dust containing 3 per cent. DDT or a sulphur dust containing 2 per cent. dinitro-o-cyclohexylphenol at the rate of 15 lb. per acre on April 19, when the average number of thrips per plant was 84·2. The average numbers after 8 and 32 hours, respectively, were 20·1 and 25 for DDT and 58 and 100 for the phenol, as compared with 130 after 32 hours on untreated plants. On other plots dusted with 20 lb. per acre on April 23, when the average number of thrips per plant was 144·4, the average numbers after 8 and 32 hours were 5·6 and 4·7 for DDT, 82 and 36 8 for the phenol, and 125 and 85·5 on untreated plants. The dusts were applied in the morning while the plants were moist with dew.

TESTS WITH DDT AGAINST A STINKBUG AND THE COTTON LEAFWORM. By J. C. Clark. In cage tests in Texas, pyrophyllite dusts containing 5 and 2 per cent. DDT gave 80 and 66 per cent. mortality of *Chlorochroa ligata*, Say, on cotton plants, and sulphur dust containing 7·5 per cent. Paris green gave 19 per cent. The mortality of untreated bugs was 15 per cent. In a field test, the 2 per cent. DDT dust, used at 5 and 10 lb. per acre, gave no mortality of *Alabama argillacea*, Hb., in six days.

TESTS WITH DDT AGAINST THE BOLL WEEVIL. By G. L. Smith. Pyrophyllite dusts containing 1 and 2 per cent. DDT, applied to caged cotton plants infested with adults of *Anthonomus grandis*, Boh., during July and August, both gave 16 per cent. net mortality after 96 hours, as compared with 77 per cent. when calcium arsenate was used.

151. COMPARATIVE TESTS OF CERTAIN INSECTICIDES AND VARIATIONS IN SCHEDULES FOR COTTON INSECT CONTROL. By J. C. Gaines. (*J. Econ. Ent.*, **36**, 1, 1943. From *Exp. Sta. Rec.*, **89**, 3, 1943, p. 339.) The yields indicated that calcium arsenate-rotenone and calcium-zinc arsenate were equally effective and better than calcium arsenate alone. The higher yield recorded on the calcium arsenate-rotenone- and

calcium-zinc arsenate-treated plats was due to aphid control in the first case and slightly better bollworm control, as well as retarding aphid increases at least two weeks in the latter. In a second experiment alternate applications of calcium arsenate and lead arsenate, using two applications of lead arsenate during the peak of bollworm injury, gave good control of both weevils and bollworms. Losses in yields occurred when cryolite was used in this manner, because of the increased weevil injury. Two consecutive applications of either lead arsenate or cryolite at the peak of bollworm injury, instead of calcium arsenate, did not prove to be effective against the weevils, thus causing a loss in yield.

152. Biological Control as a Supplement to Chemical Control of Insect Pests. By W. E. Ripper. (*Nature*, **153**, 1944, p. 448. From *Rev. App. Ent.*, xxxii., Ser. A, **10**, 1944, p. 333.) The author points out that races of certain insects showing increased resistance to insecticides have developed as a result of the survival of resistant individuals, and that the production of such races and the need for repeated treatments could both be avoided by the use of an insecticide that had little effect on the parasites and predators of the pest concerned, so that they would be abundant enough to eliminate the relatively small numbers of the latter that survived a single application. Nicotine vapour has recently been extensively and successfully used for the control of various aphids on farm and market garden crops in Great Britain, and it can be shown that a concentration of 0·8 mg. per litre kills 80-99 per cent. of certain aphids in 40-60 secs. at 60-80° F., without seriously affecting Coccinellids, Syrphids, or Braconid endoparasites.

A quantitative study of changes in the populations of *Brevicoryne brassicæ*, L., and its predators and parasites caused by the selective action of nicotine was therefore carried out. A field of brussels sprouts with an infestation of 98 million aphids per acre, in which the only natural enemies were *Aphidius brassicæ*, Marsh., and Syrphid larvæ, was fumigated on July 28, at a temperature of 78° F., with $3\frac{1}{4}$ lb. nicotine (95 per cent. pure) per acre, applied from a machine provided with a gas-proof apron and moving at 1 mile per hour, so that the insects were exposed to the fumes for one minute. Population counts on July 31 showed a reduction of 99·9 per cent. in the numbers of aphids, a marked increase in the percentage of aphids parasitized, and only a slight reduction in the numbers of Syrphid larvæ. Parasitized aphids from the field, and from a similar one that was not treated, were collected, and 100 per cent. parasite emergence was obtained in both cases. The aphid population in the treated field showed some increase between July 31 and August 3, probably owing to immigration, but was again 0·1 per cent. of the initial population on August 13. On August 18 no living aphids were found, all the survivors having been killed by parasites or predators. There were a few parasitized aphids, but no Syrphid larvæ as the Syrphid adults had not been induced to oviposit by the small number of aphids left after fumigation. Aphids reappeared a week later and, owing to the scarcity of natural enemies, reached injurious numbers after three weeks. In the untreated field, the aphid population remained almost stationary through the summer and decreased to about half its former size towards mid-September, and the populations of parasites and Syrphid larvæ remained fairly constant for four weeks, after which the proportion of parasitized aphids increased as usual. Treatment with a selective insecticide should not be carried out before the beneficial insects are established, and should be repeated if necessary or deferred to a date that would ensure that the parasites can control the newly arriving migrants. In practice it is usual to fumigate in the middle of August or September.

153. Short Notes and Exhibits. (*Ind. J. Ent.*, **3**, 1, 1941, p. 139, and **4**, 1, 1942, p. 137. From *Rev. App. Ent.*, xxxii., Ser. A, **11**, 1944, p. 396, and **12**, 1944, p. 407.) *Punjab Cotton Pests.* By A. N. Sapra. Larvæ of *Platyedra gossypiella*, Saund., in double seeds of cotton received at Lyallpur from Ludhiana (Punjab) were found to be attacked by *Pediculoides ventricosus*, Newp., which eventually destroyed them. The mite develops best at 27° C. (80·6° F.) and dies off in late April or early May at room temperatures at Lyallpur. It also attacks larvæ of *Chilo simplex*, Btlr., but those of *Sylepta derogata*, F., are relatively immune.

Burma: Cotton Pests. By S. Singh. It is stated that in observations on cotton of five varieties in Burma in 1937-39, the highest yield was obtained from the plots most heavily infested with *Pempherulus affinis*, Faust. These results were found to be statistically significant, whether the comparison was made between the most severely infested variety and the others or between plots of one variety. The increased yield is attributed to the reduction in the supply of water and nutrient salts taken in by the plant as a result of larval tunnelling, which checks vegetative growth and induces the production of flowers and is sometimes deliberately brought about by cultural methods. Very few plants suffered seriously as a result of attack after they were two months old, and the author suggests that the burrows are not moist enough to be suitable for bacteria or fungi and that the stems are seldom sufficiently weakened to break under high winds. Plants less than two months are usually killed by infestation, but such early attack is very rare.

154. MEXICO: PLAGAS DEL ALGODON Y SU CONTROL EN LA REGION DE MATAMOROS, TAMPS. I. By G. Moreno. (*Mex. Ofic. Fitosanit. Fitofilo,* January/February, 1944, p. 87. From *Bibliog. of Agr.*, October, 1944. Item 18472.) Recommendations are given for the control of the following pests of cotton: *Thrips tabaci, Colaspoides macrocephala, Strymon melinus, Loxostege similalis,* and *Noctuelia rufofascialis.*

155. COTTON INSECTS: CONTROL IN PERU. By F. F. Bibby. (*J. Econ. Ent.*, **35,** 1942, p. 193. From *J. Text. Inst.*, December, 1944, A505.) The use of arsenicals, particularly calcium arsenate dust, for control of leaf worms on cotton produced a severe aphid infestation during the summer which could be prevented by using a cryolite (20 per cent.) -sulphur (80 per cent.) dust, or cubé root (0·75-1·5 per cent. of rotenone) -sulphur on an inert carrier instead. The rotenone-sulphur dust was suitable for controlling spring infestation of aphis. The Peruvian weevil, *Anthonomus vestitus,* was controlled with calcium arsenate or a cryolite-sulphur mixture, the latter being preferable as preventing subsequent aphis infestation. Sulphur alone or with nicotine sulphate to give a 2 per cent. nicotine mixture gave satisfactory thrips control. Arsenicals for leaf- or cut-worm should be used only as bran baits.

156. PERU: MEMORIA DE LA ESTACIÓN EXPERIMENTAL AGRICOLA DE LA MOLINA CORRESPONDIENTE EL AÑO 1941. (*Rev. App. Ent.*, xxxii., Ser. A, **12,** 1944, p. 428.) *Cotton pests.*—Reported by J. W. Wille. The most important parasite of *Mescinia peruella,* Schaus, which attacked cotton as in previous years, was identified as *Nemeritis* (*Idechthis*) *peruviana,* Cushm. Two unidentified species of *Platynota* were associated with *Mescinia* and caused similar injury to the bolls and terminal buds. *Heliothis virescens,* F., again caused serious damage to cotton in the Cañete Valley; it was present, but not injurious, in other coastal valleys. Infestation of ratoon cotton in the lower parts of the Huaura Valley, which reached 50 per cent. in October and resulted in severe damage to the bolls, increased until December. In this month, the adults migrated to planted cotton, on which the first bolls were heavily infested. In February, the infestation began to decrease, owing partly to destruction of the eggs by *Orius* (*Triphleps*), but chiefly to climatic conditions and the fact that the plants were no longer so attractive, being older and in a less rapid state of growth. At the end of 1940 and the beginning of 1941, *Dysdercus ruficollis,* L., was extremely scarce on cotton in the valleys of Huaura, Supe and Pativilca, in which it is usually very injurious, because intense sunshine and lack of clouds retarded its development. It migrated in numbers to the lower valleys during February and March, by which time the first bolls were mature. These were uninjured, but those that were forming were considerably damaged. On higher ground and in late fields the first and later bolls were both attacked, and no crop could be harvested. Parasitism was negligible. In winter, the Pyrrhocorid migrated to the hills, where it was very abundant on wild plants, and in September it began to return to the valleys, flying at night in large swarms that were attracted by lights. It was numerous in October, but diminished considerably during the next two months, owing to powerful sunshine, so that bolls harvested in December showed little damage. Both *D. ruficollis* and *Anthonomus vestitus,* Boh., were relatively unimportant in the lower parts of the Piura Valley,

owing chiefly to climatic conditions, but caused more damage in the upper parts and were very injurious in parts of the Chira Valley, where a susceptible variety of cotton is grown and recommendations for a close season were not followed. As excessive foliage provides shade favourable to the insects, irrigation and fertilizing should be carried out in moderation. In the Lima Valley parasitism of *Anomis texana*, Ril., by *Blondelia* (*Eucelatoria*) *australis*, Tns., was high throughout the year, and further north parasitism by a species of *Meteorus* was common. *Alabama argillacea* was abundant in the Piura Valley, but was controlled by up to eight applications of a spray of 0·5-1 per cent. calcium arsenate, which was preferred by the growers since the applications of arsenical dusts sometimes resulted in outbreaks of *Aphis gossypii*, Glov. In May eggs were parasitized by *Trichogramma minutum*, Ril., eggs and young larvæ were attacked by a Reduviid of the genus *Zelus* and an Anthocorid, and larvæ and prepupæ were parasitized by a Braconid (*Rogas*), Tachinids and Ichneumonids, with the result that spraying was no longer necessary. Other pests observed on cotton included *Tetranychus peruviensis*, McG., which was very injurious in spring in a few fields in the upper part of the Huaura Valley, and a species of *Empoasca*, which was readily controlled with sulphur dust; *Lasioderma serricorne*, F., was found in seeds from two localities.

157. Experiments for the Control of the Cotton Aphid. By E. H. Floyd *et al.* (*Bienn. Rpt. N.E. La. Exp. Sta.* 1941-42, St. Joseph, La., 1943. From *Rev. App. Ent.*, xxxii., Ser. A, **10**, 1944, p. 332.) Nicotine was the only aphicide tested in 1942, but a "fixed" form of it (Black Leaf 155) was used as well as Black Leaf 10, and proved equally effective. Mixtures of either with calcium arsenate reduced the numbers of aphids very considerably below those on untreated plants, which were only half as severely infested as plants treated with calcium arsenate alone. Black Leaf 155 is easy to mix with calcium arsenate and can be applied in the morning or afternoon, whereas other forms of nicotine are not effective unless applied in the afternoon or when the plants are dry. Moreover, it shows no appreciable loss of nicotine content when stored with calcium arsenate in an open container; this advantage is due to the fact that moisture is required to release the nicotine from it.

Infestation by the weevil was light and late in 1942, and calcium arsenate was first applied much later than in the previous year. As a result, although the average aphid populations were similar in the two seasons, they did not increase to injurious numbers in 1942 until all the bolls had set, and so caused much less damage than they do when early applications of calcium arsenate cause them to increase during an earlier period in the development of the plants. The yields of seed cotton per acre were 2,835 lb. for calcium arsenate alone, 2,970 lb. for no treatment, 3,002 and 3,019 lb. for calcium arsenate with 1 per cent. nicotine from Black Leaf 155 and Black Leaf 10, respectively, 3,035 lb. for calcium arsenate with 2 per cent. nicotine from Black Leaf 10 in alternate applications, and 3,062 lb. for a dust containing 1 per cent. nicotine from Black Leaf 10 and no calcium arsenate.

[*Cf.* Abstr. 163, Vol. XXI. of this Review.]

158. The Effect of Boll Weevil Infestation. By A. L. Hamner. (*Miss. Farm Res.*, **6**, 6, 1943, p. 4. From *Exp. Sta. Rec.*, **89**, 6, 1943, p. 717.) Cotton plants react to the loss of squares punctured by the boll weevil by setting a higher percentage of the young bolls and by producing heavier bolls. A higher percentage of young bolls that matured was produced on plants that had as few as 10 per cent. of the squares removed throughout the season than on untreated checks. When bolls were protected from weevil damage, fewer were required to make a pound of seed cotton on the treated plats than on the check. With the exception of a few bolls set early and late in the season, four varieties of cotton set approximately 80 per cent. of their crop during the first five weeks of fruiting and over 70 per cent. during the second, third, fourth, and fifth weeks.

159. Reduced Dosages of Calcium Arsenate and Cryolite for Control of the Boll Weevil and their Effect on the Cotton Aphid. By L. C. Fife. (*J. Econ. Ent.*, **37**, 1, 1944, p. 19. From *Exp. Sta. Rec.*, **91**, 3, 1944, p. 315.) Owing to the potential scarcity of arsenicals during the war, tests were conducted in Texas (1942)

to determine the effects of reduced dosages of calcium arsenate and cryolite on the boll weevil and cotton aphid. Two series of field plat tests were carried out, each consisting of four replicated randomized blocks; applications were made at 5-day intervals from July 3 to August 12 in series (1) and from July 20 to August 27 in series (2). In (1) significant increases in yield of seed cotton were obtained in plats treated with calcium arsenate alone or mixed with sulphur. The yield from treatment with cryolite or cryolite-S mixtures was greater than in the control, but only in one case was it significant. In (2) the yields with calcium arsenate alone or in 1 : 1 mixture with S were significantly better than for the control. It was doubted whether S should be considered inert as it is somewhat effective against other insects such as pentatomids and mirids. It is believed that a considerable part of the gain from some of the treatments was due to the control of a mirid, *Creontiades signatus*, Dist. Yields were increased with cryolite and the 1 : 2 cryolite-S mixture and significantly so by 1 : 3 cryolite-S; the 1 : 1 mixture of basic copper arsenate and S gave less increase than calcium arsenate or its 1 : 1 mixture with S. Only the plats treated with calcium arsenate or with its 1 : 2 mixture with S gave significant reductions in weevil infestation. Aphids never became abundant enough to cause appreciable injury. Except for the plats treated with the 1 : 5 calcium arsenate-S mixture, dusting calcium arsenate or its mixtures with S caused significant increases in the aphid population in (1). Cryolite or cryolite-S mixtures were not followed by significant increases in aphid populations.

160. Insecticide Tests for Boll Weevil and Cotton Aphid Control in the Mississippi Delta. By R. L. McGarr and J. R. Henry. (*J. Econ. Ent.*, **36**, 5, 1943, p. 716. From *Exp. Sta. Rec.*, **90**, 3, 1944, p. 368.) Treatments with calcium arsenate alone and plus 2 per cent. of nicotine in alternate, and with calcium arsenate plus 1 per cent. of nicotine in all applications, gave good control both in plats of about 2-3·5 acres and those of 0·2 acre each. The increase in yields for the alternate applications was 415 lb. of seed cotton per acre in the large and 323 lb. in the small plats; for the second mixture the yield increases were 394 and 318 lb. respectively. With calcium arsenate minus aphicides there was a loss of 138 lb. per acre in the large and a gain of 11 lb. in the small plats. In the small-plat tests better boll weevil control was obtained with calcium arsenate alone than when mixed with sulphur (1-2), but without aphicides more aphids developed, with accompanying decreases in yield. Calcium arsenate plus nicotine and calcium arsenate-sulphur plus nicotine and Lethane 60 all gave better aphid control than calcium arsenate plus 0·5 per cent. rotenone. The tests as a whole indicated that losses in yield from aphids following the dusting of high-yielding cotton with calcium arsenate may exceed the gains from control of light to moderate weevil infestations.

161. Control of the Cotton Borer *Gasterocercodes brasiliensis*, Hambl. (Col.: Curc.), A Pest of Perennial Cotton Culture. By H. F. G. Sauer. (*Arq. Inst. Biol. São Paulo*, **14**, 1943. In Portuguese, with English abstract. From *Exp. Sta. Rec.*, **92**, 2, 1945, p. 245.) Deals with various aspects of perennial cotton culture in the Northern States of Brazil, as well as with the economic importance and control of *G. brasiliensis*.

162. Studies on the Cotton Jassid (*Empoasca devastans* Distant) in the Punjab. IV. A Note on the Statistical Study of Jassid Population. By M. Afzal *et al.* (*Ind. J. Agr. Sci.*, December, 1943, p. 634.) The insect census cannot be estimated by the arithmetic means, and the utility of the logarithmic transformation employed by Williams is dealt with at length. The population of the jassids on different varieties was estimated by the three methods, sweeping, counting, and fumigation, for five years (1937-41). The degree of infestation on the different varieties could not be determined by the analysis of variance of the actual data, as the variances in the case of the different varieties under experiment, instead of being almost equal, were of unequal magnitude and proportional to the square of the means. The data were, therefore, transformed to $\log_{10}(n+1)$. The results indicated that the order of the susceptibility of all the strains remained practically the same by the three methods, so sweeping was advised, since this was the cheapest and simplest of the methods. It

was found that Jubilee cotton, a *desi* variety, was the most resistant and 289F/K25 the most susceptible to jassid. The three commercial varieties 4F, LSS, and 289F/43 were about equal in resistance to the pest.

[*Cf.* Abstr. 172, Vol. XXI. of this Review.]

163. THE LOCUST PLAGUE. By B. P. Uvarov. (*J. Econ. Ent.*, **37,** 1, 1944, p. 93. From *Exp. Sta. Rec.*, **91,** 3, 1944, p. 313.) A brief historical account of the locust problem—one from which none of the five continents is free—beginning with early Biblical and Egyptian times and tracing the distribution of locust plagues and advances in their study and control to the present time, with a final note on the outlook for the future.

164. STUDIES ON THE ECOLOGY AND CONTROL OF THE MOROCCAN LOCUST (*Dociostaurus maroccanus*) IN IRAQ. I. RESULTS OF A MISSION OF THE IRAQ DEPARTMENT OF AGRICULTURE TO NORTH IRAQ IN THE SPRING OF 1943. By F. S. Bodenheimer. (*Iraq Dir.-Gen. Agr. Bul.* 29, 1944, p. 121. From *Exp. Sta. Rec.*, **91,** 4, 1944, p. 440.) It is considered that the spreading of poison bait is the best method of control for this pest in Iraq. The increased importance of the invasion zone for the final building up of huge swarms is considered of practical importance, since the locust campaign must be directed primarily against the gregarious swarms in this zone. The advisability of baiting the locusts on the first and second oviposition sites to prevent later oviposition is stressed.

165. THE BIONOMICS OF *Schistocerca obscura* FABR. By L. G. Duck. (*J. Kans. Ent. Soc.*, **17,** 3, 1944, p. 105. From *Exp. Sta. Rec.*, **92,** 2, 1945, p. 242.) In the region of Stillwater, Oklahoma, cotton, green manure corn, elm, persimmon, and young wheat are said to be the preferred foods for this locust. The precopulation period of the ♀ was found to be 18 days; the preoviposition period after copulation 44·1 days. The interoviposition period between the first and second egg pods averaged 8 days; between the second and third pods 9-21 days. The number of eggs per pod averaged 75·4 for the first, 42 for the second, and 31 for the third pod. The incubation period averaged 261·3 days for eggs stored at outside temperatures and 83·1 days for those stored at room temperatures (about 68° F.). The average hatch for eggs was 10·87 per cent. for those stored at room temperature and 50·3 per cent. for those stored outside. The total duration of the nymphal period outside was 51·5 days as compared with 46·1 days for those reared at 89·9°, and 51·2 days for those reared at 85°. Nymphs reared at 70° failed to complete the fifth nymphal period before termination of the study, but development of the earlier stages at lower temperatures indicated that much more time would be required under such conditions. There are 16 references.

166. CONTROL OF TERMITES. By L. Haseman. (*Missouri Sta. Bull.* 478, 1944, p. 15. From *Exp. Sta. Rec.*, **91,** 4, 1944, p. 448.) A practical account.

167. RESEARCH TESTS ON SOIL-POISONING CHEMICALS FOR THE CONTROL OF SUBTERRANEAN TERMITES. By I. Hatfield. (*Pests*, **12,** 3, 1944, p. 10. From *Exp. Sta. Rec.*, **91,** 4, 1944, p. 448.) The information presented concerns the methods of testing soil-poison chemicals and the data obtained on both termites and chemicals over a 5-year period of experimentation. It is concluded from analysis of the results that valuable new compounds will ultimately be available for use as soil poisons against these pests. However, the currently used pentachlorophenol, and its mixture with trichlorobenzene, are among the best treatments studied. For the time being and to the extent that they may be available, these materials are recommended on the basis of their value as here confirmed.

168. TERMITES OF NEW ZEALAND. By J. M. Kelsey. (*N.Z. J. Sci. and Tech.*, May, 1944. From *Nature*, 27/1/45, p. 117.) An account of the termites known from New Zealand and their identification. It would appear that there are only two species indigenous to the Dominion—namely, *Calotermes brouni*, Frogg, and *Stolotermes ruficeps*, Brauer. In addition to these, there are eight species of Australian termites that have been accidentally introduced at one time or another. Of the native species, *C. brouni* does extensive damage to wooden buildings, posts, poles, and trees. Attempts are now being made to find an effective means for its control. The other

species, *S. ruficeps*, is invariably found in decaying timber and has not so far been found attacking buildings. Of the Australian species, three kinds belong to the family Rhinotermitidæ and are members of the genus *Coptotermes*. Four species are members of the Calotermidæ, and of these three belong to the genus *Calotermes* and one to *Porotermes*. The Termitidæ are represented by a single species of *Eutermes*. The paper gives detailed description of the eight species referred to above, together with illustrations of the chief distinguishing characters that separate them.

169. Research on Tsetse Fly and Disease. (*Nature*, 4/11/44, p. 573.) The Secretary of State for the Colonies has appointed a committee to consider and advise on the co-ordination of action, including research, directed against human and animal trypanosomiasis, and, in particular, against the tsetse fly as the chief vector. The committee, on which the Dominions Office and the Sudan Government are represented, will report from time to time to the Secretary of State for the Colonies, and on all matters affecting research its recommendations will be referred to the Colonial Research Committee for comment and advice before submission to him.

170. Further Notes on the Bionomics of *Bemisia gossypiperda*, M. and L., the White-Fly of Cotton in the Punjab. By K. N. Trehan. (*Ind. J. Agr. Sci.*, February, 1944, p. 53.) A continuation of previous articles dealing with the life-history, bionomics, nature of damage, and control, of *Bemisia gossypiperda*, the white-fly of cotton in the Punjab. The present paper discusses the following: Behaviour of the adults—sex proportion in nature, attraction to different colours, range of flight, oviposition, selection of leaf surface for oviposition, oviposition in relation to constant temperature; Relative incidence on different varieties of cotton; Incidence of white-fly attacks in relation to the amount of water applied to the cotton crop in the field; Incidence of white-fly attack under different conditions of cultivation.

[*Cf.* Abstr. 493, Vol. XVII. of this Review.]

171. Introduccion a la Fitopatologica. By M. V. Fernandez Valiela. (Federacion Universitaria de Buenos Aires, Centro Estudiantes de Agronomia, 1942. From *Rev. App. Mycol.*, xxiv., **1**, 1945, p. 28.) This valuable acquisition to phytopathological literature comprises the most complete account of plant diseases and cognate subjects hitherto published in the Spanish language. In addition to copiously documented up-to-date information on the incidence, geographical distribution (with special reference to Argentina), symptomatology, etiology, modes of perpetuation, economic effects, and control of numerous fungal, bacterial, virus, and physiogenic diseases, the treatise contains sections dealing with such general matters as the antecedents of phytopathology and its relation to other branches of science, the pathological changes induced by disease, the influence of environmental conditions, the classification of parasites and diseases, resistance and immunity (natural and acquired), and the like; the taxonomy and morphology of the bacteria and fungi concerned in the causation of plant diseases; the preparation and application of fungicides; and plant-protective legislation. An appendix furnishes instruction on the collection and transmission of specimens, the preservation of herbarium material, and the various regional phytopathological services at the disposal of Argentine farmers; a host index is provided with a list of the diseases affecting each. Two useful charts are enclosed, one dealing with the classification of the fungi, and the other (partly coloured) with the symptoms produced by the cereal rusts and their organs of reproduction.

172. Nomenclature of Fungi. By G. R. Bisby. (*Mycologia*, **36**, 3, 1944, p. 279. From *Exp. Sta. Rec.*, **91**, 6, 1944, p. 652.) A review of some of the mycological nomenclature problems, with suggestions for a few possible interpretations, revisions, or additions to the rules which may prove useful for discussion, especially since the adoption in 1930 of the type method necessitates reconsideration of much past procedure.

173. Contributions towards the Fungus Flora of Uganda: Fungi Imperfecti. By C. G. Hansford. (*Proc. Linn. Soc. Lond.*, 1942-43, **1**, p. 34. From *Rev. App.*

Mycol., xxiii., **10**, 1944, p. 409.) A further instalment of the author's annotated list of Uganda fungi. In connection with cotton, *Colletotrichum* (*Glomerella*) *gossypii* occurs on cotton bolls, mostly in wet seasons. *Alternaria gossypina* and *A. macrospora* have been observed on cotton leaves, and the latter has been isolated from stained lint. Cotton is also infected by *Cercospora* (*Mycosphærella*) *gossypina*. [*Cf.* Abstr. 403, Vol. XX. of this Review.]

174. COTTON SEEDLING DISEASE: OCCURRENCE IN WEST CHINA. By L. Ling and J. Y. Yang. (*Ann. Bot.*, **8**, 1944, p. 91. From *Summ. Curr. Lit.*, xxiv., **21**, 1944, p. 487.) A species of *Colletotrichum*, which differs from the conidial stage of *Glomerella gossypii* in morphological characters, was noticed on diseased cotyledons and bolls of cotton in Szechuan Province, West China. It was considered to be identical with *C. indicum*, Dast. Morphological and cultural characteristics are described and the results of investigations of the influence of temperature and *p*H on germination and growth are reported. The conidia are susceptible to desiccation. The production of toxic substances capable of causing blight of cotton seedlings was not confirmed. Artificial infection was successful on both Chinese varieties of *Gossypium arboreum* and American varieties of *G. hirsutum*. Soaking of seeds in conidial suspensions of the fungus resulted in a high percentage of diseased seedlings. Lesions on the cotyledons, young stems, young leaves, and detached bolls were induced by spraying with the conidial suspension. Besides cotton, fruits of pepper, tomato, eggplant, and pods of soybean and cowpea were successfully infected, but no plant included in the tests was found susceptible at the seedling stage. The fungus overwinters chiefly inside the infected seeds and possibly in the affected host tissues left in the field. Fairly high temperature in combination with high humidity favours the development of the disease, the latter factor being even more important under the conditions of the cotton-growing regions of Szechuan. A rainy or cloudy period not only facilitates the dissemination of conidia, but also prevents the mucilaginous matrix from drying out; hence the conidia may survive for a longer period.

175. INFECTION OF COTTON SEEDLINGS BY *Colletotrichum gossypii* AS AFFECTED BY TEMPERATURE. By C. H. Arndt. (*Phytopathology*, **34**, 10, 1944, p. 861. From *Exp. Sta. Rec.*, **92**, 2, 1945, p. 221.) When infested seeds were germinated at 18°, 22°, 25°, 29°, 33°, and 36° C., anthracnose lesions appeared earliest at 29° and 33°. Relatively low percentages of seedlings were infected and killed at 33°; at 29° much larger proportions were infected and killed, but not so large as at 22° and 25°. The last approximated the optimum temperature for maximum infection and injury to the hypocotyls and cotyledons, 18° greatly reduced the incidence of seedling infection, and at 36° there was no infection at all. All seedlings infected at 25° and 22° were killed before the fourteenth day; at 33° many of the lesions remained small and did not greatly retard seedling growth. The percentages of the seedlings of the lots killed in the laboratory at 22° were indicative of the response of these lots to seed treatment in field plantings.

176. OBSERVATIONS ON THE METHOD OF TRANSMISSION OF INTERNAL BOLL DISEASE OF COTTON BY THE COTTON STAINER-BUG. By Helen L. Frazer. (*Ann. App. Biology*, **31**, 4, 1944, p. 271.) The investigations described were carried out at the University of Manchester at the instance of and with the aid of a grant from the Empire Cotton Growing Corporation. The results close a gap in the ætiology of internal boll disease of cotton, and, by analogy, of stigmatomycosis involving infection with the *Nematospora* group of fungi in a wide range of other plants. The following is the author's summary:

" Results are presented to show that all the rules of proof for insect transmission of *Nematospora* by *Dysdercus* spp. have now been satisfied—viz., a close association of the insect with diseased plants in nature; visitation of healthy plants by the insect under conditions suitable for transmission of the disease; the presence of the pathogen in or on the insect in nature or following visitation to a diseased plant; and experimental production of the disease by insect visitation under controlled conditions. Hence it is claimed that *Dysdercus* spp. are proved vectors of internal boll disease of cotton. Fungal material as spores or mycelium is carried as an external contaminant

on the mouth-parts, although it is located in the deep stylet pouches, where protection is afforded and spore germination is possible. The fungus is cast off with the exuviæ during moulting, but recontamination from exuviæ or other sources in the environment occurs. The transmission is hence purely mechanical with the insect obligatory only in its function as a syringe to inject the fungus which is otherwise unable to reach its substrate. Insect and fungus can develop independently and the insect is apparently unharmed by the presence of the fungus. *Nematospora* spores also reach the intestine but do not appear to remain viable there and do not germinate. The fungus is believed to enter and leave the insect by the same route. The spores are well adapted in shape to reach the stylet pouches of the insect. No alternative morphological form of *Nematospora gossypii* within the insect has been found The results do not lead to methods of control of the disease beyond those in practice—trapping of insects, destruction of alternative host plants, and the alteration of time of planting to avoid insect attack."

The observations on insects bred in captivity were checked by the examination of field material of *Dysdercus* forwarded from Nyasaland by Dr. E. O. Pearson. Results showed that 60 per cent. of the insects fixed immediately on collection from heavily infested cotton plants had *Nematospora* spores present in the stylet pouches; 63 per cent. had spores in the intestine. Only in the stylet pouches was evidence of germination found; in the intestine the spores frequently showed signs of disintegration. No recently moulted insects had spores in the pouches, although 71 per cent. of these had ungerminated spores in the intestine. This observation supports the conclusion of the author that the ability of *Dysdercus* to produce infection is lost on moulting until recontamination occurs, in contrast to the results reported by Müller (Abs. 226, Vol. XVII. of this Review) in the case of stigmatomycosis of citrus in Java, which were that the bugs concerned remained infective for life even if they had access to infective material only once as newly hatched larvæ.

177. A New Species of Metarrhizium Active in Decomposing Cellulose. By S. Pope. (*Mycologia*, xxxvi., **4**, 1944, p. 343. From *Rev. App. Mycol.*, xxiii., **12**, 1944, p. 494.) An account is given of the author's study of a fungus isolated from deteriorated baled cotton stored in Washington, D.C., and found to have extraordinary activity in decomposing cotton fabric. It has been used in the evaluation of mildew-proofing agents and the resistance of fabrics to rotting. It is easily handled in culture, sporulates freely, and has remained stable in its cultural characteristics and cellulose-decomposing activity for three years. The fungus, which is named *Metarrhizium glutinosum*, n.sp., when grown on filter paper produces a sparse, white mycelium in which arise small tufts of compact conidiophores that form a palisade layer in each tuft. The moist conidial masses produced on these tufts often coalesce, forming masses 0·5 to 2 mm. in diameter. The dusky olive-green to olivaceous-black, cylindrical conidia have rounded ends, measure 6 to 9·6 by 1·5 to 3·9 μ, are formed on sterigmata in basipetal succession and united by disjunctors, but break away in the conidial mass soon after formation. The penicillately branched, erect, septate conidiophores measure 50 to 85 μ in length; the ultimate branches are verticillate, composed of 1 to 3 sterigmata, and measure 10 to 22 μ in length. The chlamydospores are produced in bulbous terminal portions of the hyphæ found near the substratum and embedded in the mycelium. The mature chlamydospores are almost round, smooth, buckthorn-brown, measure 7·4 to 9 μ in diameter, and have a small, tapered papilla at one side.

178. Mildew in Cotton: The Problem of Standardizing Test Methods for Mildew and Rot Resistant Treatments for Textiles. By H. D. Barker *et al.* See Abstract 280. Soil Suspension Method for Testing Mildew Resistance of Treated Fabrics. By M. S. Furry and M. Zametkin. See Abstract 282. A Mildew-Proofing Treatment. By C. F. Greeves-Carpenter. See Abstract 281. Flame-, Mildew-, and Water-Proofed Cotton Fabrics: Production. By C. N. Rabold. See Abstract 283.

179. Rhizoctonia Leaf Spot of Cotton. By D. C. Neal. (*Phytopathology*, xxxiv., **6**, 1944, p. 599. From *Rev. App. Mycol.*, xxiii., **12**, 1944, p. 485.) A hitherto

unreported leaf spot of cotton caused by *Corticium solani* was observed in mid-July, 1943, on Deltapine plants at Baton Rouge, Louisiana, and subsequently in adjacent fields on Coker, Delfos, and other varieties. The symptoms are distinctive, consisting of light brown, dark purple-bordered, interveinal spots of irregular shape and variable size, which later become necrotic, the diseased tissues cracking or falling out and presenting a ragged, shot-hole aspect. At the same time the surrounding tissues assume a chlorotic discoloration. The light to yellowish-brown mycelium of the fungus was present in abundance on and near the lesions on the lower leaf surfaces. The fungus was readily isolated on potato dextrose agar and inoculated with positive results on the Coker, Deltapine, and Delfos varieties, the incidence of infection on which amounted to 80, 60, and 83·3 per cent. respectively. Under the conditions of cloudy skies and moderate temperatures favouring infection by *C. solani*, the incubation period was about six or seven days. Although the leaf spot causes a certain amount of shedding the reduction of yield from this source has not so far been substantial.

180. COTTON ROOT ROT ORGANISM: CONTROL BY SULPHUR. By A. A. Dunlap. (*Phytopathology*, **33**, 1943, p. 1205. From *Summ. Curr. Lit.*, xxiv., **21**, 1944, p. 487.) When thoroughly mixed with the soil and autoclaved, 325-mesh dusting sulphur, at the rate of one part per 1,000 of air-dry black Houston clay soil, totally inhibited the formation of sclerotia by the agent of cotton root rot, *Phymatotrichum omnivorum*, with no apparent effect on mycelial growth. At 1 : 2,000 the same mixture permitted only a trace of sclerotial growth, which proceeded unchecked, however, in the presence of a 1 : 8,000 concentration. The repressive action of the sulphur-soil mixture is possibly due to the formation of a toxic compound on autoclaving.

181. STUDIES ON THE ROOT ROT OF COTTON IN SIND.—I. By N. Prasad. (*Ind. J. Agr. Sci.*, February, 1944, p. 40.) Isolations from rot-affected roots of cotton collected from different places in Sind gave cultures of *Fusarium* and *Rhizoctonia*. Both of these were found to be parasitic. They were identified as *Fusarium cæruleum* (Lib.), Sacc., and *Rhizoctonia bataticola* (Taub.), Butl. *Rhizoctonia solani*. Kühn, which causes root rot of cotton in the Punjab, was not found in any of the isolations.

182. REMEDIAL MEASURES FOR TIRAK IN PUNJAB-AMERICAN COTTONS. By R. H. Dastur. (*Ind. Frmg.*, June, 1944, p. 254.) Discusses the symptoms, causes, and the intensity and spread of *tirak* disease. Experiments have demonstrated that with late sowing and closer spacing of the cotton crop there is less damage from *tirak* and also from jassids.

183. DIE TOPALLIK-ERKRANKUNG DER BAUMWOLLE. By G. Gassner. (*Phytopathol. Ztschr.*, **14**, 5, 1943, p. 518. From *Exp. Sta. Rec.*, **91**, 1, 1945, p. 42.) In the extensive cotton districts south of Adana and Tarsus in southern Turkey, the author observed a condition designated by the growers as Topallik disease, characterized by lack of roots and the consequent drying up of the plant. The malady is ascribed to an abnormal rise in the salt content of the soil during the summer drought.

184. GENERA OF THE PLANT VIRUSES. By H. H. McKinney. (*J. Wash. Acad. Sci.*, xxxiv., **5**, 1944. From *Rev. App. Mycol.*, xxiii., **11**, 1944, p. 427.) After reviewing the nomenclature and classification of viruses, the author proposes to accord them the rank of a division in the Plant Kingdom, to be designated Viriphyta, and gives an outline of his system of binomial classification, which follows, in the main, the International Rules of Botanical Nomenclature. In this system the ten families of Holmes are consolidated into two, Marmoraceæ and Rugaceæ, all viruses inducing mosaic and most of those inducing necrosis in the parenchyma tissues falling into the former, and all those tending to cause malformation but not mosaic-mottling, those inducing yellows type of chlorosis, and nearly all those producing phloem necrosis into the latter. Eight of Holmes's generic names are retained, and several new genera, species, and combinations are proposed. The characters of the various orders, families, and genera are described, and a detailed account given of the type species of each genus. A key to the genera is also supplied.

185. RECENT ADVANCES IN VIRUSES: A BRIEF SURVEY OF RECENT WORK ON VIRUSES AND VIRUS DISEASES. By E. H. Lennette. (*Sci.*, **98**, 1943, p. 415. From

Pl. Bre. Abs., xiv., **2**, 1944, p. 125.) Recent advances in virus research are reviewed. Differences between viruses and bacteria are discussed and it is believed that no absolute distinction between them can be drawn. Plant viruses appear always to contain ribonucleic acid, but those found in animals may contain this substance or desoxyribose nucleic acid.

186. Evidence for the Evolution of Phytopathogenic Viruses from Mitochondria and their Derivatives. II. Chemical Evidence. By H. G. Du Buy and M. W. Woods. (*Phytopathology*, **33**, 1943, p. 766. From *Pl. Bre. Abs.*, xiv., **2**, 1944, p. 125.) Chemical evidence is presented in support of the theory that plant viruses have arisen from mitochondria, the latter being regarded as structures equivalent to plastids but lacking the pigmentation complex. Ribose nucleic acid was demonstrated in the protein fraction of extracted plastids, and it is suggested that the latter have given rise to viruses by the loss of the pigment and lipoid components.

187. The Importance of Cotton Seed in the Dissemination of Verticillium Wilt in California. By B. A. Rudolph and G. J. Harrison. (*Phytopathology*, **34**, 10, 1944, p. 849. From *Exp. Sta. Rec.*, 92, **2**, 1945, p. 221.) Isolations over a 5-year period from 3,371 mature cotton bolls on plants severely affected with *V. albo-atrum* showed that the fungus had reached only 150 receptacles and penetrated to the bases only of the placental columns of two bolls. Since in no case had it reached the seed, internal infection is highly improbable. Contamination of the lint by spores and microsclerotia is believed equally improbable; 11,723 cultures made from tiny black bodies—erumpent or superficial—on diseased cotton stalks failed to yield the pathogen, indicating that microsclerotia are not produced on the old dead stalks overwintered in the field. Spore production was never observed in the field on any plant in California and probably never—or at least very rarely—takes place. Cotton lint proved a poor medium for the fungus to grow upon; only when constantly saturated in culture tubes did it support growth. It seems highly improbable that such conditions would be found in the field or in cotton piles at the gins. All the evidence is against the infection or contamination of the lint by the fungus on an economically important scale.

188. Physiological Cotton Wilt in the Sudan Gezira. By A. S. Boughey. (*Ann. Appl. Biol.*, xxxi., **1**, 1944, p. 12. From *Rev. App. Mycol.*, xxiii., **9**, 1944, p. 340.) Observations made during the 1941-42 season in experiments on cotton wilt in the Gezira area of the Sudan indicate that between the tenth and eighteenth weeks after sowing—*i.e.*, mid-October to mid-December—three factors may cause water stress in the crop, namely, a drastic reduction in the size of the absorbing system of the plant which occurs at some time during this period and is correlated with maximum boll development, considerably increased day temperatures accompanied by higher evaporation, and a rapid decline in the amount of available water in the soil. It is suggested that a coincidence of these three factors at high intensity results in permanent wilting and death of the plants, while at lesser intensities wilting will be followed by recovery, but with reduction of yield. Support to this hypothesis was lent by experimental data on plant growth, soil water, and atmospheric conditions. It is suggested that wilt can be controlled by delaying the sowing date, using late-maturing cotton varieties, and increasing the frequency and amount of irrigation. The present disappearance of wilt from the southern and central Gezira is attributed to exactly these measures, which had been adopted for the control of blackarm. The author expresses the opinion that a return to the normal early dates of sowing would lead to considerably increased losses from wilt.

GENERAL BOTANY, BREEDING, ETC.

189. Fundamentals of Cytology. By L. W. Sharp. (McGraw-Hill Book Co., Inc., New York and London, 1943. $3.00. From *Rev. App. Mycol.*, xxiii., **11**, 1944, p. 451.) This textbook, intended for use in connection with college and university courses in the biological sciences, contains numerous references of interest

to mycologists and plant pathologists, including sections on the cytology of reproduction in the fungi, the structural components of protoplasts (among them the intracellular bodies characteristic of certain plant viruses), chromosomal aberrations, and so forth. A list of works proposed for reading in conjunction with each chapter is appended.

190. CYTOLOGICAL INVESTIGATIONS ON AUTO- AND ALLO-TETRAPLOID ASIATIC COTTONS. By N. K. Iyengar. (*Ind. J. Agr. Sci.*, February, 1944, p. 30.) Meiosis has been described in the autotetraploid *G. herbaceum*, 1027 ALF. Chromosome conjugation was studied at metaphase I in the autotetraploids of two strains of *G. herbaceum*, of two strains of *G. arboreum* and in the allotetraploids obtained from three hybrids between the above two species. A high proportion of quadrivalents is seen in all the tetraploids. On an average, the proportion of quadrivalents is slightly lower in the allotetraploids. Maximum association, leading to 13 quadrivalents, is met with rarely. Meiosis, at later stages, is in general regular, and finally normal sporads are mostly formed. But the pollen is largely defective, particularly so in the autotetraploids. The autotetraploids are pollen sterile and do not cross with the cultivated Asiatic diploids, but some success was obtained when the autotetraploids were crossed with the cultivated Americans. The allotetraploids are self-fertile to a certain extent. The progeny of the tetraploids had mostly 52 somatic chromosomes, indicating that in the tetraploids gametes with 26 chromosomes seem to function most. Meiosis in a sterile hybrid plant ($2n=52$) obtained from the cross between the autotetraploid *G. herbaceum* (1 A.L.B.) and *G. hirsutum* (Co 2) showed that many of the chromosomes of the three A sets are associated as trivalents and the chromosomes of D set left as univalents. The sterility in this hybrid may be partly due to the irregularity initiated by the formation of trivalents and univalents in large numbers, caused by the constitution AA (AD).

191. CYTOLOGICAL INVESTIGATIONS ON HEXAPLOID COTTONS. By N. K. Iyengar. (*Ind. J. Agr. Sci.*, April, 1944, p. 142.) Chromosome conjugation has been studied in four hexaploids involving cultivated Asiatic and cultivated American cottons, two hexaploids involving wild American and cultivated American, and two hexaploids involving wild African and cultivated American cottons. Conjugation has also been studied in the triploids from which the hexaploids were derived. Though the triploids showed marked variations in conjugation, the hexaploids showed only slight differences. The progeny behaviour of the several hexaploids studied showed that gametes with 39 chromosomes seem to function most in the parent hexaploids, and some of the gametes have the same constitution as the triploid progenitors. Crosses of hexaploids with suitable diploids gave fertile tetraploids with 52 chromosomes. During meiosis, the chromosomes paired mostly as bivalents. These facts indirectly show that the cultivated American cottons with 52 chromosomes are allopolyploids having two sets of Asiatic and two sets of wild American chromosomes.

192. PRINCIPLES OF GENETICS. By H. L. Ibsen. (John S. Swift Co. Inc., St. Louis, Chicago, New York, Cincinnati, 1942. Mimeographed. Reviewed *Pl. Bre. Abs.*, xv., **1**, 1945, p. 87.) "As a science develops from a heterogeneous body of disconnected observations to a closely integrated system of fact, generalization and explanatory hypothesis, a corresponding transition is often found in the methods of presentation adopted by the writers of its textbooks. In the earlier days of a science, accounts of the relevant facts tend to be presented in an historical framework, since this affords the most evident scheme of interrelation, but as further knowledge is obtained, such a mode of presentation is usually replaced by a more logical order, basic principles being expounded first and the more complicated relationships developed from them. Genetics has now reached the stage where this logical method may be attempted, and the book under review represents an interesting example of such an endeavour. Dr. Ibsen's treatment is general, although, since his bent is chiefly zoological, he lays special emphasis on sex linkage and sex determination. Historical matter is reduced to a brief biographical sketch of Mendel in Chapter V; a note not entirely free from inaccuracies, since Mendel did not begin his scientific work until after he entered the monastery at Brünn. Also, can we be sure that Darwin

would have modified his evolutionary theory if he had seen Mendel's paper? The significance of Mendel's work was so generally overlooked that to postulate a hypothetically different attitude, even on the part of Darwin, may not be fully justified. The arrangement of the book is good and the presentation, on the whole, lucid. Diagrams are freely used and add much to the clarity of the exposition. Several readers might prefer a more detailed account of relevant cytological processes, but in the limited space available such an omission is readily understandable. The sequence adopted is a brief account of the chromosomes, followed by simple genetical segregations, modified segregation ratios, epistasis, multiple factors, modifiers, multiple allelomorphs, linkage and sex linkage, chromosomal aberrations and selection and breeding methods. Every effort is made to treat these various aspects harmoniously, the concordances between theory and fact being stressed rather than the data that still remain without a satisfactory explanation. It is a debatable matter how far unexplained facts should be introduced in a textbook intended for university students, for although it is necessary to give first-year students a comprehensive picture of established theory, it is unwise to avoid all controversial issues, as this tends to develop an improper respect for insufficiently grounded hypotheses."

Certain criticisms are also made by the reviewer, chiefly on points of detail, but it is stated that such criticisms do not detract from the admirable qualities that this book exhibits.

193. Genetics the Unifying Science in Biology. By G. H. Shull. (*Torreya*, **43**, 1943, p. 126. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 24.) A brief résumé is given of historical developments in biology since the Renaissance, and the thesis advanced that genetics is able to integrate the diverse tendencies that have arisen in this science with the accumulation of more specialized knowledge.

194. The Physiology of the Gene. By S. Wright. (*Physiol. Rev.*, **21**, 1941, p. 487. From *Pl. Bre. Abs.*, xiv., **4**, 1944, p. 275.) The term gene is used at present in two different senses, firstly for the units of heredity and secondly for circumscribed loci on the chromosomes. It is pointed out, moreover, that the number of gene loci in an organism is not indefinite. Non-Mendelian heredity may prevail in the Bacteria and Cyanophyceæ where nuclear organization is either absent or rudimentary. Cytoplasmic inheritance may be demonstrated in higher organisms by the differences found between reciprocal crosses, but it is not always easy to distinguish such a mode of inheritance from the effects of virus infection or dauer-modifications. Non-Mendelian heredity operates most frequently in interspecific or intergeneric crosses and is also found in some cases of merogonic hybridization. The relative importance of the nucleus and cytoplasm in growth is discussed, also the causes of differentiation which are believed to reside chiefly in the cytoplasm. In the second half of the paper the following topics are discussed: (*a*) the relation between genes and enzymes, (*b*) the problem of factor interaction and mode of operation, with special reference to pigment determination, and (*c*) the significance of dominance and multiple allelomorphism.

195. Concerning "Genotypes." By F. W. Pennell. (*Sci.*, **99**, 1944, p. 320. From *Pl. Bre. Abs.*, xiv., **4**, 1944, p. 290.) The word "genotype" is used in two senses, firstly by taxonomists, to mean the type species of a genus, and secondly, by geneticists, to mean the combination of genes in an organism. It is suggested that the second usage should be preferred on etymological grounds, and that the term "generitype" should be used for the taxonomic concept.

196. On Inheritance and its Changeability. By T. D. Lysenko. (*Socialističeskoe Seljskoe Hozjaistvo*, Nos. 1-2, 3-4. Moscow, 1943. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 26.) An account is given of the author's genetical theories, which are now becoming generally accepted by Russian plant breeders. The genotype is regarded as a plastic entity and capable of being altered by the "assimilation" of "nutrients." "Assimilation" is used in a much wider sense than customary and is applied to any absorption into the plant of things external to itself; the term "nutrient" is used in a correspondingly wide sense for things so absorbed. Under

optimum environmental conditions the genotype reproduces itself unaltered, which explains the apparent examples of pure lines. When, however, conditions are less favourable, the genotype has to "assimilate environmental conditions which do not correspond to its nature, and organisms or individual organs are produced which differ to a greater or lesser degree from the preceding generations." Many genotypes are "conservative," that is to say, they resist induced change, but by suitable treatments, *e.g.* grafting, hybridization or exposure to certain environmental conditions, this conservatism may be "shattered." Moreover, the type of change induced in the genotype is not random, for "the hereditary nature of any character can be changed in the direction of the external conditions applied." The principal evidences for these theories are outlined and it is held that both vernalization and grafting are able to alter the genotype which "assimilates," in the first case, certain phasic conditions, and, in the second, substances contained in the sap, the combination of the old genotype and the "nutrient" forming a new genotype. Fertilization and pollination are also regarded as "assimilatory" processes, the gametes assimilating each other mutually. An account is given of loss of vigour from inbreeding, and this the author explains, by an application of the concepts of the Marxian dialectic to the theory of "assimilation," as due to the absence of "vital contradiction." The "vital impulse" is believed to derive its "vital energy" from the synthesis of vital antinomies, either by mutual assimilation as in normal sexual reproduction or by the assimilation of "nutrients" that is believed to occur in grafting. Inheritance is classified along lines suggested by Timirjazev. Heredity may be simple, when the progenies resemble the parents, or compound, when they do not. Compound heredity may again be either complex or mutually exclusive. In the first case, the properties of both parents appear in the offspring, either localized in different parts (mixed inheritance) or fused to form some intermediate condition (coalescent inheritance). Mutually exclusive inheritance covers those cases in which only one parental character is represented in the offspring, and this includes two cases again: Millardet inheritance, where segregation does not occur, and Mendelian inheritance, where it does. Only some of these hereditary patterns are found in sexual reproduction, but all are believed to occur in the progenies of graft hybrids. The author's references to Mendelian genetics as practised outside the U.S.S.R. are critical, and it is believed that such studies are of little practical importance. The methods of plant breeding introduced by Michurin and Lysenko have won much favour in the U.S.S.R., for it is believed that these techniques may produce a new variety in three years, while the methods of classical genetics are held to be much slower and less productive.

197. O Gen Como Unidade Auto-Reprodutiva da Fisiologia Celular. By T. Dobzhansky. (*Rev. Agr., Piracicaba*, **18**, 1943, p. 387. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 25.) This is a Portuguese translation of an address given in Piracicaba, Brazil, on July 24, 1943. The gene's great stability, its power of reproduction and its analogy with viruses in many points of behaviour, are cited amongst its more fundamental properties. As soon as a change (mutation) takes place, competition occurs and a process of natural selection, and hence of evolution, sets in.

198. The Genetic Basis for Constructing Selection Indexes. By L. N. Hazel. (*Genetics*, **28**, 1943, p. 476. From *Pl. Bre. Abs.*, xiv., **2**, 1944, p. 115.) The author gives a multiple correlation method of constructing selection indexes with maximum accuracy.

199. The Genetic Approach to Problems of Rare and Endemic Species. By G. L. Stebbins, Jun. (*Madroño*, **6**, 1942, p. 241. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 27.) In this paper an attempt is made to account for endemism by means of genetical hypotheses. Willis's concept of "Age and Area" and Fernald's concept of senescence are rejected in favour of the hypothesis that endemic species are genetically homogeneous and therefore adapted to only a narrow range of ecological conditions. Such homogeneity might arise either by "depletion," in which an originally continuous population characterized by considerable genetical variability becomes split up into segments, in which inbreeding and random fixation deplete the genetic

heterogeneity, or by the development of insular species derived from only a few ancestral plants in which genetical heterogeneity has been absent from the start.

200. GENETIC ACTION AS STUDIED BY MEANS OF THE EFFECTS OF DIFFERENT DOSES AND COMBINATIONS OF ALLELES. By C. Stern. (*Genetics*, **28**, 1943, p. 441. From *Pl. Bre. Abs.*, xiv., **2**, 1944, p. 115.) The increase in the number of doses of a mutant allele by means of duplications (in the absence of any other allele of the same locus) is shown to lead cumulatively to more nearly normal phenotypes. In certain cases, however, the presence of a normal allele may lead to a mutant phenotype. An attempt is made to give a theoretical interpretation of the relationship between phenotypic effect and primary interaction of gene and gene substrate.

201. INDORE INSTITUTE OF PLANT INDUSTRY: PROGRESS REPORT OF THE COTTON GENETICS RESEARCH SCHEME, 1943-44. Studies of lintless mutants in Asiatic cottons have resulted in the evolution of five independent lintless genes. One of the lintless races also carries a previously unrecorded recessive gene for much branched stellate hairs. The inheritance of red fuzz in *G. hirsutum* is shown to be complex. Yield trials with bulks from X-ray progenies confirmed their superiority over control. The gene for 5-loc bolls appears to be unstable. Jassid resistance in Upland cottons was shown to be slight in young plants, resistant types differing from susceptibles in their ability to grow away from the attack. Further improvement in wilt-resistant lines in Indian cottons is reported. Extensive heterosis effects have been recorded in crosses between various *G. arboreum* ecotypes. A doubled hybrid of *G. arboreum* × *G. thurberi* was fertile when pollinated with *G. hirsutum*. A doubled *G. hirsutum* × *G. raimondii* was partially self-fertile. Sorting seed for size and sowing the larger sized fraction gave a 20 per cent. increase in yield. Significant differences in yield were also demonstrated between crops sown with seed from different sources. Discriminant functions for selections for yield were calculated from a wide range of *G. arboreum* varieties, and from a group of selections from local Malvi cotton. The two were similar.

202. GENETICS OF SINGLE LOBE LEAF MUTANT IN COTTON. By K. Ramiah and Bhola Nath. (*Ind. J. Gen. and Pl. Brdg.*, **3**, 89, 1943.) The mutant character single lobed leaf is shown to be governed by a recessive gene (s) which is independent of the leaf shape multiple allelomorph series and is also independent of Y and Lc_1. Both heterozygous and homozygous single lobed plants were in defect in segregating progenies.

203. ON THE OCCURRENCE OF THE COMPLEMENTARY GENE FOR CRUMPLED, Cp_a, IN ROZI COTTON. By B. Nath and G. K. Govande. (*Ind. J. Genet. Pl. Brdg.*, **3**, 1943, p. 133. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 9.) The distribution of the genes cp_a and cp_b is described with special reference to Rozi cotton.

204. A NEW GENE FOR LINTLESSNESS IN ASIATIC COTTONS. By G. K. Govande. (*Curr. Sci.*, **13**, 1944, p. 15. From *Pl. Bre. Abs.*, xiv., **4**, 1944, p. 282.) A new lintless gene li_d has been discovered in Broach 9 cotton growing at Baroda. A similar mutant but of independent origin has also been found in Viramgam. Monomeric segregation for lintlessness is obtained by crossing mutant strains with linted varieties, while crosses involving other lintless types show that the li_d is independent of other lintless genes but complementary to most of them.

205. IMMUNIZACION MEDIANTE LA FORMACION GENETICA DE VARIEDADES RESISTENTES A LAS ENFERMEDADES DE LA PLANTAS. By F. Mujica. (*Bol. Sanid. Veg. Chile*, iii., **1**, 1943, p. 15. From *Rev. App. Mycol.*, xxiii., **12**, 1944, p. 494.) This is a survey of some notable recent advances in the development of immunity to diseases in plants by genetic methods.

206. RECENT STUDIES ON INHERITANCE OF QUANTITATIVE CHARACTERS IN PLANTS. By H. H. Smith. (*Bot. Rev.*, **10**, 1944, p. 349. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 23.) A review of recent contributions to the subject of quantitative genetics is presented. After discussing the different estimates as to the number of quantitative genes determining any one character, an account is given of the methods of analysing quantitative inheritance. The need for caution in interpreting skewed frequency distribution is emphasized. Other aspects treated include heterosis, the physiology

of development, the cytological basis of quantitative genes and the effect of the cytoplasm.

207. ESTRUTURA DOS CROMOSOMIOS. By E. A. Graner. (*Rev. Agr. Piracicaba*, **18**, 1943, p. 419. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 27.) The present state of knowledge regarding the internal structure of the chromosomes and various points on which opinions differ are outlined.

208. CHROMOSOME BREAKAGE AND THE NUCLEIC ACID CYCLE. By C. D. Darlington and L. F. LaCour. (*J. Genet*, **46**, Nos. 2 and 3, January, 1945, p. 180.) The subject is discussed under the following heads: Part I. The parts of the problem. II. Cell effects of X-rays and temperatures. III. Chromosome breakage in the roots. IV. Chromosome breakage in the pollen. V. The control of events by the cell. VI. Breakage and reunion. The following conclusions are presented: X-rays act directly on nucleus and cytoplasm. They also act indirectly on each through the other. The difficulty of separating these nuclear and cytoplasmic effects has been so great that investigators have assumed them to be naturally independent. By separating them in experiment and by comparing experimental and spontaneous breakage, the authors have shown them to be connected in nature and connected by way of the nucleic acid cycle whose variations they can therefore be used to reveal. This conclusion is based on a combination of two groups of observations. The first are observations on mitotic frequency and nucleic acid excess and starvation after X-raying at different temperatures, summarized at the end of Section II. The second are observations of breakage and reunion of chromosomes at a later stage in the same series of experiments, summarized in Section VI. D. The evidence contradicts previous observers with regard to the relation of chromosome size and temperature to breakage, the healing of breaks and the rejoinability of unbroken chromosome ends, the classification and interpretation of minute fragments, and the causes of sister reunion. The differences are attributed to differences in experimental design and method of recording. The authors have tested both of these in different plants and tissues with different temperatures and doses, and they claim that their methods have given results consistent enough to be applied to the elucidation of the structure of the resting nucleus and of its living activity.

Two appendices are included discussing (1) The calculation of sister-reunion frequency (Dr. K. Mather), and (2) Pollen grains and pollen tubes. A bibliography of 77 names is also included.

209. CHROMOSOME CONJUGATION IN PENTAPLOID COTTONS. By N. K. Iyengar. (*Ind. J. Genet. Pl. Brdg.*, **3**, 1943, p. 99. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 9.) An account of the meiotic behaviour of four allopentaploid cottons. All were characterized by a high trivalent frequency.

210. THE PRODUCTION OF PLANTS HAVING AN EXTRA PAIR OF CHROMOSOMES FROM SPECIES HYBRIDS OF COTTON. By J. O. Beasley and M. S. Brown. (*Rec. Genet. Soc. Amer.*, **12**, 1943, p. 43 (Abst.). From *Pl. Bre. Abs.*, xiv., **4**, 1944, p. 317.) Additional chromosome pairs have been added to the chromosome complements of American Upland cottons by crossing this tetraploid type with diploid species, duplicating the chromosome sets of the triploid hybrids by means of colchicine, and subsequent repeated back-crossing to Upland cotton. In this way 54-chromosome strains have been obtained containing, in one case, two chromosomes from *G. arboreum* var. Nanking, and in the other, a pair from *G. Harknessii*. The meiotic behaviour of these new forms is briefly described.

211. VERATRINE, A NEW POLYPLOIDY INDUCING AGENT. By E. R. Witkus and C. A. Berger. (*J. Hered.*, **35**, 1944, p. 131. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 29.) A 0·1 per cent. solution of veratrine sulphate in tap water has been found effective in inducing polyploidy. Chromosome doubling may occur either through complete inhibition of spindle formation, or through fusion of daughter nuclei after incomplete anaphase separation, or through the failure of anaphase separation due to sticky chromosome bridges.

212. HETEROSIS. By T. Dobzhansky. (*Rev. Agr., Piracicaba*, **18**, 1943, p. 397. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 24.) In introducing a discussion on heterosis,

the author suggested that populations may be of three types: (1) those in which self-fertilization is the predominant method of reproduction or the effective population size is very low: here both recessive and dominant deleterious mutations will be eliminated and there will be little or no heterosis; (2) those with intermediate or large effective population size: here deleterious recessives will accumulate and heterosis will occur on crossing, though it will be possible to produce vigorous inbred strains; (3) those with very large effective population size: here the maximum accumulation of deleterious recessives will occur, and since any one chromosome will very rarely occur in the homozygous condition, heterosis will be at a maximum and no amount of selection will produce inbred strains equal in vigour to outbred ones.

213. HETEROSIS. By W. G. Whaley. (*Bot. Rev.*, **10**, 8, 1944, p. 461. From *Exp. Sta. Rec.*, **92**, 2, 1945, p. 190.) The author of this analytical review (148 references) concludes that any attempt to arrive at a single definitive explanation of the genetic basis of hybrid vigour seems unwarranted with the evidence at hand. The fundamental processes responsible for producing hybrid vigour may differ somewhat in various organisms, but all of them are factors increasing the physiological efficiency. Like other effects, the hybrid vigour level may be supposed to differ in response to environmental changes. Solution of the heterosis problem awaits much more evidence as to the general action of genes governing size. "In problems of developmental genetics the background of hybrid vigour offers a more fertile field for study than ever before."

214. THE PROBLEM OF HETEROSIS. By G. F. Sprague. (*Chronica Botanica*, **7**, 1943, p. 418. From *Pl. Bre. Abs.*, xiv., **4**, 1944, p. 290.) The various theories proposed to explain hybrid vigour are reviewed. The theory of interaction of dominant growth factors and the theory of physiological stimulation are not mutually exclusive when the latter explanation is put on a genetical basis. Heterosis is manifested at various stages of the life cycle according to the plant used; the proximate cause of increased vigour appears to be an increase in the number of cells, not a larger cell size.

215. AN EXPANSION OF JONES'S THEORY FOR THE EXPLANATION OF HETEROSIS. (*Amer. Nat.*, **78**, 1944, p. 275. From *Pl. Bre. Abs.*, xiv., **4**, 1944, p. 290.) This paper develops the theory that "heterosis and dominance are different degrees of expression of the same physiological genetic phenomena." Data are presented from tomato hybridization experiments to demonstrate that both conditions are controlled by the interaction of environmental and genetical factors, the latter being the resultant of a complex of interacting genes.

216. THE FERTILITY OF AN INTERSPECIFIC HYBRID OF COTTON. By S. Nakatomi. (*Pl. Bre. News*, **9**, 1934. From *Pl. Bre. Abs.*, xiv., **3**, 1944, p. 226.) An F_1 plant from the Egyptian Ashmouni ($n=26$) $\times$ a Manchurian variety (*G. herbaceum*, $n=13$) bore no seed when selfed, but on being pollinated by King's Improved (*G. hirsutum*, $n=26$) gave a few seeds. A plant raised from among these flowered abundantly and was partly fertile, selfed or crossed. It had $n=26$ chromosomes.

217. THE CAUSES OF HYBRID STERILITY AND INCOMPATIBILITY. By W. P. Thompson. (*Trans. Roy. Soc. Can.* 1940, **5** (*Biol. Sci.*), 3, p. 34. From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 5.) A review of the causes underlying incompatibility and hybrid sterility is presented. The following incompatibility mechanisms are listed: (*a*) failure of pollen to germinate, (*b*) slow growth of pollen tubes in the style, (*c*) bursting of the pollen tubes, (*d*) death of the pollen tubes other than by bursting, (*e*) inability of the sperms to fertilize the ovum or the secondary nucleus; (*f*) embryonic or post-embryonic abortion, (*g*) failure of the endosperm to develop, and (*h*) abnormal endosperm development. Hybrid sterility can be attributed to (*a*) pre-meiotic disturbances, (*b*) abortion of pollen grains, (*c*) slow development of pollen grains, (*d*) failure of pollen to germinate, (*e*) failure of pollen tubes to reach the embryo-sac, (*f*) abortion of megaspores, (*g*) abortion of the embryo-sac, (*h*) aberrant development of the endosperm, and (*i*) embryonic abortion. The basic causes determining these effects may be genetic, chromosomal, or due to influence of the cytoplasm.

218. METHODS OF PLANT BREEDING. By H. K. Hayes and F. R. Immer. (McGraw-Hill Book Co., New York and London, 1942. From *Exp. Sta. Rec.*, **91**, 3, 1944, p. 268.) The subject-matter of this textbook, which has been used in both undergraduate and graduate courses, considers the rôle and genetic and cytogenetic basis of plant breeding; mode of reproduction in relation to breeding methods; techniques in selfing and crossing; the pure-line method of breeding naturally self-pollinated plants; hybridization as a method of improving self-pollinated plants; the backcross method; breeding for disease and insect resistance; inheritance in wheat, oats, barley, and flax; methods of selection for special characters; development of methods of corn breeding; inheritance in corn; controlled pollination methods for breeding cross-pollinated plants; seed production; some commonly used measures of type and variability; field-plat technique; randomized blocks, Latin squares, and χ^2 tests; correlation and regression in relation to plant breeding; and multiple experiments, methods of testing a large number of variables, and the analysis of data expressed as percentages. Tabular material is presented in an appendix, and a bibliography, glossary, and index are provided.

219. THE PLANT BREEDER AND THE SOIL. (*Trop. Agr.*, October, 1944, p. 181.) The tendency in many modern systems of agriculture, where the aim is to utilize more and more effectively the nutrient resources of the soil, is to grow better and better varieties and strains of crop plants capable of more vigorous growth than their predecessors. Considerable success has been achieved by the plant breeder, whose efforts have made this practice possible, and his services have consequently been much sought after in recent years. The main lines of work in plant breeding comprise breeding for quantity, breeding for quality, and breeding for resistance to pests and diseases. In connection with the first, quantity in crop production is usually gauged by yield per acre, either of bulky vegetable material such as sugarcane stalks, seeds such as maize-corn and oil seeds, special appendages such as cotton lint, etc. Generally speaking, the chief reason why a more vigorous variety thrives on the limited resources of a given soil better than a variety of lower vigour is that it is *capable of utilizing soil nitrogen more efficiently*. Thus, according to the teaching of the new science of agrobiology, in order to produce a larger number of growth units in a particular crop plant growing in a particular soil, a new variety must be evolved which can manufacture a greater amount of carbohydrate per unit of nitrogen absorbed than can the older varieties. The essential inherent biochemical difference, therefore, between a variety giving a high yield and another variety of the same crop plant giving a lower yield, when both are grown under identical growth conditions, is indicated by its wider carbohydrate-nitrogen ratio, or more simply though less precisely by its lower nitrogen content per cent. dry matter.

The main objection to placing too much reliance on the plant breeder is that it tends to encourage a neglect of good husbandry. Where the cultivator can obtain largely increased yields from lands of diminishing fertility by the simple procedure of replacing an old variety by a newer more vigorous strain, without necessarily having to maintain a high standard of cultivation, he naturally tends more and more to overlook the need for soil maintenance. The down-grade changes are insidious; they go on unsuspected until suddenly it is realized, perhaps too late, that soil exhaustion has arrived, and that even the most vigorous variety will no longer yield an increase. The aim of the plant breeder is to produce varieties of crop plants that will extract full benefit from the soil, while that of the good agriculturist is to ameliorate and build up his soil so that it will provide the best possible medium for plant growth. Full co-operation between the two is highly desirable and should eventually produce the best results, but the plant breeder should never allow himself to become a party to soil exploitation or to forget the fundamental ecological principle on which all agricultural endeavour is based—namely, that the plant, the soil, and the atmosphere are but the components of a single biological system, and that the plant only produces best when in complete harmony with its growth environment.

220. THE USE OF COLCHICINE IN PLANT BREEDING. By H. Dermen *et al.* (*Bur. Pl. Ind., Soils, Agr. Eng.*, Agr. Res. Admin. U.S. Dpt. Agr., 1943. (Mimeographed.)

From *Pl. Bre. Abs.*, xv., **1**, 1945, p. 29.) A short account is given of the action of colchicine on plant tissues. Details of the technique used in the artificial induction of polyploidy follow.

221. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The twenty-fourth number of Series A, Genetics, will be published shortly, and will contain the following papers reprinted from the *Journal of Genetics*:

COLCHICINE-PRODUCED POLYPLOIDS IN *Gossypium*. II. OLD WORLD TRIPLOID HYBRIDS. By S. G. Stephens. The compatibility of tetraploid *arboreum* with other Old World species and the cytology of two resulting triploid hybrids is reported. The results obtained, when considered in relation to diploid species of *Gossypium* as a whole, lead to the following conclusions:

(i) Crosses within the Old World group and within the American group may be considered potentially compatible. In such crosses failure to set viable seed is due to failure of fertilization, and this may be determined by relatively simple mechanical difficulties. On the other hand, crosses between Old World and American species are easily obtained, but the hybrid zygote nearly always fails to develop. This incompatibility appears to be due to lack of harmony between the development of the zygote and surrounding tissues. The endosperm/zygote balance is one of several mechanisms involved. The nature of the other mechanisms is still obscure. (ii) The degrees of first metaphase pairing found in synthesized triploid hybrids form a quantitative series ranging from Skovsted's Asiatic autotriploid to the allotriploid, tetraploid Asiatic × *armourianum*. This suggests that the *gradual* quantitative change shown by Silow (1944) to be responsible for speciation in the *arboreum-herbaceum-anomalum* group is a process which has been continued throughout the genus, and that gross structural changes have been superimposed on the basic mechanism. (iii) The relationship between *G. stocksii* and other Old World species is still obscure, since the cytological evidence conflicts with other sources of information. (iv) Evidence is presented which suggests that *G. anomalum* may be regarded as a species bridging the Old World and American groups.

A GENETIC SURVEY OF LEAF SHAPE IN NEW WORLD COTTONS. A PROBLEM IN CRITICAL IDENTIFICATION OF ALLELES. By S. G. Stephens. An extensive genetic survey of New World cottons has shown that leaf shape is controlled by a single multiple allelomorph series having a minimum of four members, $\mathbf{L^S}$, $\mathbf{L^O}$, $\mathbf{L^E}$, and **l**. It was not found possible by orthodox genetic analysis to decide whether closely similar but not identical leaf shapes were or were not controlled by the same allele, $\mathbf{L^O}$. Even with an improved technique which made use of developmental studies, critical evidence could not be obtained. It was decided that the chances of transferring a gene *singly* from one species to another with the object of comparing it with other genes on a common background are very slight. This, more than any other factor, presents an obstacle to comprehensive analysis of the allelomorph system. The interspecific distribution of the four distinct alleles is considered in relation to the evolution of New World cottons.

THE MODIFIER CONCEPT: A DEVELOPMENTAL ANALYSIS OF LEAF-SHAPE "MODIFICATION" IN NEW WORLD COTTONS. By S. G. Stephens. Differences in opinion as to the rôle of modifiers (polygenes) in genetic mechanisms suggest that new methods of attack would be of value. Developmental studies provide a possible line of approach. Leaf shape in New World cottons furnishes suitable material for developmental study. Analysis shows that the major source of modification in leaf-shape expression is the interaction of the leaf-shape alleles with genes controlling flowering habit. On transference from a late- to an early-flowering background, the action of the leaf-shape alleles is accelerated, but, as a compensatory effect, the period of development is reduced. If compensation were exact the shape of the climax leaf would be unaffected by change in flowering habit. In the cases studied, however, *over-* and *under*-compensation occur, so that the shape of the climax leaf is "shifted." In interspecific crosses involving different leaf-shape alleles, transgressive segregation in F_2 of genes controlling flowering habit is associated with transgressive

segregation in rate of leaf-shape development. Consequently, measurements of climax leaves show increased variability, frequently leading to intergradation of the "main" leaf-shape classes. The fact that flowering habit has been a character of undoubted selective value during the evolution of cotton under domestication, whereas any selective value of leaf shape *per se* has yet to be proved, shows that modifiers are not necessarily genes of minor importance—their modification of the expression of another gene being only one of several possible pleiotropic effects. Neither is there any *a priori* reason to suppose, in the absence of any understanding of the physiological processes which they control, that modifiers have individually small effects.

CANALIZATION OF GENE ACTION IN THE *Gossypium* LEAF-SHAPE SYSTEM AND ITS BEARING ON CERTAIN EVOLUTIONARY MECHANISMS. By S. G. Stephens. A phenogenetic analysis of leaf-shape expression in the genus *Gossypium* as a whole suggests that the alleles controlling the various forms are members of a single canalized system. The system appears to be composed of five alternative developmental tracks, the *courses* of which are but slightly affected by changes either in environment or in the rest of the genotype. The *final phenotypic expression* attained, however, may be considerably modified by such changes. The chief modifying mechanism appears to be retardation or acceleration of the actions of the leaf-shape alleles in relation to development of the plant as a whole. Every such alteration in "timing" is capable of changing the shape of the climax leaf. Characters dependent on a canalized system of development may be expected to show a restricted capacity for modification, though the number of phenotypic variants possible may still be considerable. The effects of such restriction are considered in relation to two evolutionary phenomena: (*a*) the expression of dominance, (*b*) the occurrence of non-adaptive trends. It is shown that both phenomena would be expected as a result of natural selection acting on characters controlled by canalized systems.

222. PLANT GROWTH SUBSTANCES. By V. T. Stoutemeyer. (*Proc. Amer. Soc. Hort. Sci.*, **42**, 1943, p. 365. From *Nature*, 27/1/45, p. 118.) The relation between molecular configuration and activity of plant growth substances or auxins has yet to be elucidated; but the author reports that the addition of methyl, hydrogen and isoprene groups at various positions on naphthalene acetic acid does not reduce its root-forming properties. The addition of the isoprene group in some cases actually increased activity, while tetrahydronaphthalene acetic acid usually caused the production of a greater weight of roots per cutting (without increasing the number of cuttings rooted) than the unreduced acid. The same worker later reports that while naphthalene butyric acid is as effective as (and less toxic than) the corresponding acetic acid; and the isoprene ester of the naphthalene butyric acid is still more effective, α-naphthalene α-propionic and α-naphthalene β-propionic acid were both less effective than α-naphthalene acetic acid.

223. THE CHEMICAL TESTING OF PLANT NUTRIENT SOLUTIONS. By G. S. Fawcett and R. H. Stoughton. (Salisbury: The Tintometer, Ltd., 1944. Price 8s. 6d. Reviewed *Nature*, 17/3/45, p. 316.) The routine testing of plant nutrient solutions is undoubtedly an important part of most investigations on the soilless growth of plants, and the genuine investigator must therefore be competent to carry out the necessary chemical operations. In this book, which is essentially a set of directions for carrying out the tests, the authors have succeeded in reducing the operations to as simple a form as possible, to give speed in analysis but yet to retain an accuracy sufficient for the purpose. This result has been achieved by employing, in all cases, colorimetric or nephelometric methods which must be used in conjunction with the "All-Purpose Lovibond Comparator" and special standard colour and turbidity disks and comparator tubes. The chemical methods have been selected from textbooks and the literature, and have been adjusted and critically tested under the conditions existing in plant nutrient solutions. They provide for the estimation of the major plant nutrients and the minor and trace elements manganese, iron, boron, copper and zinc. In some cases the methods are tentative and the authors hope to

improve these. As with the simplification of many chemical methods, the applicability is restricted, in this case to plant nutrient solutions only, and the authors are emphatic that all details be adhered to closely. If this advice is followed, the novice can carry out some of the tests by himself, but others involve highly corrosive chemicals; and although ample detail and space is devoted in the early part of the book to the very elementary operations of handling chemical glassware and reagents, those who are inexperienced in chemical technique should, in the opinion of the reviewer, receive a short preliminary training. This book, together with the specially designed apparatus, should prove a great help to experimenters in the soilless cultivation of plants.

224. THE INVESTIGATION OF PLANT NUTRITION BY ARTIFICIAL CULTURE METHODS. By D. I. Arnon and D. R. Hoagland. (*Biol. Rev., Cambridge Phil. Soc.*, **19**, 2, 1944, p. 55. From *Exp. Sta. Rec.*, **92**, 2, 1945, p. 185.) This review (126 references) presents a general survey of the subject. Several types of culture are described, including liquid culture methods and those depending on a solid inert medium. The advantages of artificial culture procedures for growing plants are pointed out as one means of studying soil-plant interrelations, as well as various questions in the physiology and biochemistry of plants. These techniques have proved indispensable in investigating the chemical elements essential to growth in the higher plants, especially those needed in only minute amounts. These methods are also highly valuable for studying the absorption of ions by roots, and they serve for inquiries into the interreactions of climatic conditions and mineral nutrients. Among other topics considered are the applications of these methods to researches on the functions of inorganic nutrients in plant metabolism, the rôle of colloids in ion absorption, horticultural and agronomic problems, and commercial production of crops (*e.g.*, hydroponics).

225. THE NATURE OF HEREDITY. By T. D. Lysenko. (*Proc. Lenin Acad. Agr. Sci.*, U.S.S.R., 1942, Nos. 11-12: 3-5. From *Pl. Bre. Abs.*, xiv., **2**, 1944, p. 115.) The author maintains that more knowledge can be gained as to a plant's hereditary nature by studying its reactions than by hybridization. The argument is illustrated by reference to phasic development in cereals.

226. HEREDITY, DEVELOPMENT, AND INFECTION. By C. D. Darlington. (*Nature*, cliv., 3901, 1944, p. 164. From *Rev. App. Mycol.*, xxiii., **12**, 1944, p. 472.) The author concludes, after a review of the evidence, that proteins in the cytoplasm can now be put in a rough genetic classification. On the one hand, there are proteins put together by the nucleus with the help of desoxyribose nucleic acid. These need not be self-reproducing. On the other hand, there are other proteins, plasmagenes and viruses, formed in the cytoplasm only from pre-existing proteins of similar type. These molecular types depend for their reproduction on ribose nucleic acid and are conditionally self-perpetuating. The plasmagene is a protein which can be made outside the nucleus and comes to be inherited through the egg. The virus is a similar protein which is capable of being acquired later. It is a protein which prospers through being in the wrong organism and gets there by infection. Both classes are very heterogeneous. In addition, both are considered to be continuously arising *de novo* and rapidly evolving on account of the high frequency of their mutations and the rapidity of their selection.

227. INFECTION OF COTTON SEEDLINGS BY *Colletotrichum gossypii* AS AFFECTED BY TEMPERATURE. By C. H. Arndt. See Abstract 175.

228. COTTON PLANT: METABOLISM. By F. J. Richards. (*Ann. Bot.*, New Ser., **8**, 1944, p. 43. From *Summ. Curr. Lit.*, xxiv., **21**, 1944, p. 507.) The methods used by Mason and Phillis in analysing their data are examined, and it is shown that many of their conclusions and theories are not supported by the data. Without further experimental evidence, supplemented by adequate statistical analysis, both the water-content relations and the partitioning between soluble and insoluble fractions of N, P and carbohydrate are more complex phenomena than envisaged by Mason and Phillis.

[*Cf.* Abstrs. 256, Vol. XX., and 455, Vol. XXI. of this Review.]

229. COTTON PLANTS: TOLERANCE TO SOIL SALTS. By N. A. Henkel and S. S. Kolotova. (*C. r. Acad. Sci. U.S.S.R.*, **39**, 1943, p. 209. From *J. Text. Inst.*, December, 1944, A503.) When the leaf stems are immersed in various salt solutions and the leaves are exposed to diffused daylight, yellow spots and patches appear after varying lengths of time, depending on the tolerance of the given variety to the salts. Leaves of plants grown in salty soils exhibit high tolerance, and yellowing appears only when the salt concentration of the leaf juice is much greater than that found in normal plants exhibiting an equal degree of chloroplast destruction.

230. COTTON PLANT: DEVELOPMENT IN EGYPT AND THE SUDAN GEZIRA. By F. Crowther. (*Ann. Bot.*, **8**, 1944, p. 213. From *Summ. Curr. Lit.*, xxv., **2**, 1945, p. 21.) An account is given of observations on morphological characters, production of dry matter, absorption of nitrogen, and yield, all recorded from replicated experiments, which furnish a comparison of the development of the cotton crop in the Sudan Gezira and in the Nile Delta. The two areas, both irrigated from the Nile, are 1,200 miles apart. The Sudan crop is a winter one and the Egyptian a summer one. There were marked differences in early growth, which was rapid in the Sudan, but in Egypt retarded by low temperature. The growing season in Egypt, initially limited by low temperature, was also prematurely curtailed by bollworm infestation. In Egypt an early-maturing crop is achieved in part by the adoption of a spacing much closer than formerly and closer than that practised in the Sudan Gezira. Leaf growth was closely associated with rate of absorption of nitrogen, the relative leaf-growth rate in both countries being highly correlated with percentage of nitrogen in the leaf dry weight. Nitrogen absorption relative to plant size was more rapid during early growth in the Sudan than at any time in Egypt. Maturation of the bolls was delayed in the Sudan by low winter temperatures. The yield capacity of the Sudan Gezira crop, judged in terms of production per unit of either vegetative growth or nitrogen absorbed, was as efficient as or even more efficient than that of the crop in Egypt. Yield in the Sudan appeared to depend more upon soil factors than did yield in Egypt, and to be closely related to nitrogen supply.

231. OSMOTIC QUANTITIES IN GROWING COTTON BOLLS. By T. Kerr and D. B. Anderson. (*Pl. Physiol.*, **19**, 2, 1944, p. 338. From *Exp. Sta. Rec.*, **91**, 5, 1944, p. 523.) Variations in the osmotic pressures of sap expressed from immature cotton seeds and the variation in diffusion pressure deficit values (D.P.D.) of living seeds of the same ages were measured for a 24-day period during the growth of the seeds. In seeds younger than 24 days the osmotic pressures exceeded the D.P.D.; in older seeds the reverse was true, the divergence increasing rapidly with age. Neither the D.P.D. nor the amount of water absorbed by the seeds was reduced by treatments inhibiting respiration. It is suggested that the lack of equilibrium between osmotic pressures and D.P.D. is more apparent than real, and that imbibition is largely responsible for the absorption of water by cotton seeds.

232. ABSORPTION OF SALTS BY COTTON FROM SOLUTIONS OF HIGH CONCENTRATION. By P. A. Henckel *et al.* (*Acad. des Sci. U.S.S.R. Comp. Rend.* (*Dok.*), **42**, 1944, p. 33. From *Bibliog. of Agr.*, October, 1944. Item 16452.) Treatment of cotton seedlings with salt solution prior to planting makes them more resistant to alkaline soil.

233. THE OCCURRENCE AND INHERITANCE OF A NEW TYPE OF HAIRINESS IN ASIATIC COTTONS. By K. Ramiah and V. N. Paranjpe. (*Curr. Sci.*, **13**, 158, 1944.) A single recessive gene was discovered in "Viramgam lintless" (*G. herbaceum*) which causes the development of stellate hairs with 20-30 short rays instead of the usual 2-12.

234. STUDIES IN THE PERIODIC PARTIAL FAILURES OF THE PUNJAB-AMERICAN COTTONS IN THE PUNJAB. IX. THE INTERRELATION OF MANURIAL FACTORS AND WATER SUPPLY ON THE GROWTH AND YIELD OF 4F COTTON ON LIGHT SANDY SOILS. By R. H. Dastur and M. Singh. (*Ind. J. Agr. Sci.*, December, 1943, p. 610.) *Summary.*—The investigation describes the results of two field experiments of the multiple-factor type with 4F Punjab-American cotton, on light sandy soils at the Lyallpur Agricultural Farm. In the first experiment the main effects and interactions of nitrogen, phosphorus, potassium, organic manure and water supply were studied.

In the second experiment, early and late applications of nitrogen were included as separate factors, and organic manure was omitted. The remaining factors were the same as in the previous experiment. The cotton in the first experiment followed a one-year fallow, the second was conducted under an intensive system of cropping. The investigation brought out facts of physiological interest and practical value, and the main findings have been summarized as follows:

Nitrogen is the most potent factor that stimulates vegetative and reproductive development on light sandy soils. It brings about co-ordinated development of the plant in all directions and the effects are both quantitative and qualitative. Nodes, flowers, bolls, internodal length, dry weight, boll weight and yield are all affected favourably by its use. Nitrogen is, therefore, not only important for meristematic activity but also for extension growth and proper maturation of seed and lint. Nitrogen prolongs the functional activity of the plant and delays senescence. The net assimilation rate, leaf growth rate and efficiency index remain at higher levels during flowering in the N-treated plants as compared with the controls. Nevertheless nitrogen does not materially modify the inherent growth characteristics, as the general trends with peaks and depressions are not shifted by its application. Nitrogen applied early or late does not delay the onset of flowering. The peak point is only slightly shifted. The major portion of the increase in flowers due to nitrogen is recorded in the period of maximum flowering. The August application of nitrogen is definitely more efficient in the production of cotton per unit dry matter as compared with the application made before sowing. There is, however, only a small and insignificant difference in the actual yields in favour of the late application. Single dressing of 50 lb. N per acre, made early or late, is more effective per unit of nitrogen than the combined dose of 100 lb. per acre. Heavy watering significantly increases the internodal length, boll size, and yield, but the responses are small in magnitude. Increased water has practically no influence on the meristematic activity. There is a strong interaction between nitrogen and water on soils allowed to recuperate by fallowing and cultivation prior to cropping. Under these conditions nitrogen added depends on extra water supply for its full effect. If cotton follows an exhaustive crop such as *toria*, nitrogen gives larger responses even under normal water supply, and effect of increased water duty is merely additive. Potassium, singly or in combination, has not shown any effect on any of the observations recorded. Phosphorus has shown beneficial effect in the absence of organic manure and nitrogen only in the first experiment. Phosphorus and potassium neither interact with each other nor do they enhance the utility of nitrogen. Thus they can neither replace nor augment nitrogen under field conditions. There are high correlations between yield and other characters—*i.e.*, height, dry matter, flowers, bolls and boll weight. Treatment yields are closely associated with the growth behaviour and the reproductive development. Developmental records, therefore, are fairly accurate guides to the ultimate performance of treatments in yield under similar cultural conditions.

X. The Interrelation of Sowing Date, Nitrogen, Water Supply and Spacing on Growth and Yield of 4F Cotton. By R. H. Dastur and M. Singh. (*Ind. J. Agr. Sci.*, February, 1944, p. 18.) Describes the results of factorial experiments carried out on the light sandy soil at the Lyallpur Agricultural Farm in connection with the interrelations of the four factors, sowing date, nitrogen, water supply, and spacing, and the effectiveness of late sowing as an alternative ameliorative measure for *tirak*. The results indicated that delay in the sowing of cotton by a given period does not cause an equivalent delay in the reproductive phase. The commencement of flowering is advanced only by about $\frac{1}{5}$ the interval between sowings. The peak and cessation of flowering are still less affected. The plant exhibits photoperiodism. As flowering retards the vegetative activity of the plant, less and less time is at the disposal of the successive sowings for the production of dry matter, which therefore falls in proportion to the delay in sowing. The meristematic activity, as given by the number of nodes and flowers, falls off progressively according as the dry weight is reduced in the later sowings. There is a steady increase in the setting percentage as well as boll weight with delayed sowing. These counter-

balancing tendencies raise the yield status of later sowings under unmanured conditions. Nitrogen application and late sowing both increase the N-concentration and correspondingly the boll weight. The beneficial effects of nitrogen on the dry weight, the weight of seed cotton per boll and the yield diminish as sowing is deferred. Increase in boll number with nitrogen application is not as high in the third sowing as in the first two sowings. Widely spaced plants grow taller and produce greater dry matter than those closely spaced. Boll number and yield under wide spacing are, however, made up in the first two sowings, but close spacing becomes necessary for the last sowing to counteract the depression in boll number. Close spacing is more effective in the removal and the utilization of nitrogen than wide spacing, especially in the last sowing, this effect being more pronounced on vegetative and also the reproductive development. Mean response to water is small and general. It has shown no interaction with any other factor.

XI. Trends in Growth of Normal and *Tirak* Affected Plants, with Special Studies on Bolls. By R. H. Dastur and A. Ahad. (*Ind. J. Agr. Sci.*, April, 1944, p. 152.) The following is taken from the summary: There were no marked differences in the growth rate curves of normal and *tirak*-affected plants. There was a depression in the relative growth rate of plants on sandy loams with saline subsoil in the months of September and October. On light sandy soil the relative growth rate was higher than that of the plants on normal sandy loams during the early stages of growth. This was due to the very sandy nature of the soil in the former case. Similar differences were found in the net assimilation rate of plants on these types of soil. The percentage distribution of dry matter in bolls was higher on normal sandy loams than on soils where *tirak* occurred. The percentage of the dry matter in the bolls was least on light sandy soils with sodium clay in the subsoil. The study of the growth of bolls at weekly intervals on normal soil and on soils where tirak conditions appeared showed that the growth of bolls of *tirak*-affected plants ceased after the 28 days' stage. There was no increase in the dry matter of the whole boll after that stage. The same remarks also applied to the carpels and seeds. Lint, however, continued to increase in weight even in *tirak*-affected plants up to the 49th day stage. In the case of normal bolls growth continued up to the 49th day stage in all its parts. The dry matter per boll in *tirak*-affected plants was nearly one-half of the dry matter per boll in normal plants. Thus the bad opening of the bolls was preceded by a cessation of growth which generally occurred in the fifth week after setting. The volume, length, and diameter of bolls from *tirak*-affected plants were less than those of the bolls of normal plants. The maximum increase in dimensions occurred during the first three weeks after setting. Bolls from normal plants contained about 91 per cent. of fully mature seeds, while those from *tirak*-affected plants contained 30 to 36 per cent. of immature seeds, 25-30 per cent. of partially immature seeds, the remainder being mature seeds. There was more moisture in normal bolls than in *tirak*-affected bolls. The total number of seeds per boll in normal soil varied from 30-35 with an average of 31·66, while in the saline and light sandy soils it varied from 17-25 per boll, with an average of 22·50 and 21·60 respectively.

[*Cf.* Abstr. 301, Vol. XXI. of this Review.]

235. Variation in the Measurable Characters of Cotton Fibres. VI. Variation in the Uncollapsed Diameter of the Cotton Fibre. By R. L. N. Iyengar. (*Ind. J. Agr. Sci.*, December, 1943, p. 646.) For the purpose of this study the uncollapsed diameter of the fibre was determined at the three regions, (*a*) micropylar end, (*b*) right side (raphe facing the observer and micropyle pointing upwards), and (*c*) the chalazal end. The results indicated that in most cases the diameter is greater at the micropylar end, less at the right side and still less at the chalazal end. The coefficient of variation is smaller at the right side than at the other two regions. The variability appears to be greater in the rain-grown *arboreum* cottons than in the irrigated *hirsutum* varieties.

236. Length, Fineness, and Strength of Cotton Lint as Related to Heredity and Environment. By N. I. Hancock. (*J. Amer. Soc. Agron.*, **36**, 6, 1944, p. 530. From *Exp. Sta. Rec.*, **91**, 6, 1944, p. 666.) Measurements given on the properties of

length, fineness, and strength of cotton lint were made on the fibrograph and arealometer (developed at the Tennessee Experiment Station) and Pressley fibre strength tester (Arizona Station). These lint properties are definitely genetic characters of the cotton plant, and varieties show significant differences in their expression. Environmental conditions of the area where a variety is grown are found to have an important influence upon expression of the three lint properties. While these lint properties may be considered independent genetically, under variable environments fineness follows length in a positive manner and strength follows length in a negative manner.

237 South Carolina: Seed Characters and Lint Production: Relation of Naked Seed to Lint Percentage, Lint Index, Staple Length, and Seed Index in Sea Island Cotton. By J. O. Ware *et al.* (*J. Hered.*, **35**, 5, 1944, p. 153. From *Exp. Sta. Rec.*, **92**, 1, 1945, p. 44.) In seed cotton of the Westberry, Bleak Hall, and Andrews varieties of Sea Island cotton, location and size of seed fuzz tufts—whether on one or both ends of the seed or large or small—did not materially affect the level of lint percentage, lint index, staple length, or seed index. The magnitude of each of these characteristics depended on variety. Fuzzless or naked seed individuals of the Seabrook variety produced lint percentage and lint index values definitely lower than those of its normal seed fuzz forms; staple length and seed index were not affected much by condition of seed fuzz. Gaddis cotton had a much larger proportion of naked seeds and shorter staple, lower lint percentage, lint index, and seed index than Seabrook, but no significant differences were apparent in the levels of these four characteristics to the different fuzz grades. Results of Gaddis progeny rows in 1943 verified this relationship. Naked seed in Sea Island appeared to be a recessive character.

238. On the Variation in Lint Characters among Different Plants of the Strain Broach Desi 8. By Srinagabhushana. (*Ind. Text. J.*, October, 1944.) An account of experiments carried out with B.D.8 (Broach Desi 8) cotton to evolve a strain with higher ginning percentage and longer staple than the original variety, but retaining all its other desirable features of good wilt resistance, fineness, regularity, maturity, etc.

[*Cf.* Abstr. 266, Vol. XX. of this Review.]

239. Structure of the Walls of Phloem Fibres. By R. D. Preston. (*Chron. Bot.*, **7**, 414, 1943. From *Nature*, 16/9/44, p. 366.) The author points out that there is now considerable scope for the botanist, and especially the biophysicist, to make his contribution to the knowledge of the fine structure of the cellulose walls of plant cells. Owing to their commercial value the fibres of the phloem (sclerenchyma) have so far been chiefly studied; in these the X-ray diagram indicates the presence of cellulose chains in the longitudinal direction only, while observations on swollen walls by optical methods have led to the view that at least two layers are present and that they differ in the direction of their cellulose chains. Crossed cellulose chains definitely occur in the walls of certain algæ. The X-ray diagrams of fibres of hemp and jute reveal the presence of cellulose chains in one direction only, running parallel with the major extinction plane; this diagram remains the same for fibres of different degrees of wall thickening, suggesting homogeneity of wall construction. However, by optical examination of swollen walls in cross-section, there is indication of heterogeneity, which does not appear to be accounted for entirely by differential distribution of lignin and pectin. Differential swelling of the wall in different regions leads to the production of striations of various kinds. Also the swollen material is easily broken into separate fibrils with associated change in direction of cellulose chains, which appears to have misled at least one worker. Swelling under certain conditions produces a "ballooning" of the outer wall layer in hemp, but not in jute, and this fact, associated with observed optical phenomena, suggests that the outer layer in hemp and the inner in jute differ appreciably from the rest of the wall. It seems clear that in such walls the aggregates of the cellulose complex must differ in their association with one another in the different layers. Comparisons with long collenchyma cells suggest that the optical heterogeneity may be due to a variation in

angular dispersion of the cellulose chains from layer to layer; this argument is less convincing for hemp and jute fibres, but not precluded by the X-ray diagram. There is, therefore, still doubt as to whether any chains exist in the secondary wall of these phloem fibres other than those which run in the longitudinal direction.

240. Control of Weeds and Grasses in Cotton by Flaming. By J. W. Neely and S. G. Brain. (*Miss. Sta. Circ.* 118, 1944, p. 6. From *Exp. Sta. Rec.*, **91**, 4, 1944, p. 473.) The principle of the process is that of the adjustment of a very hot airblast flame so that it can be drawn by a tractor along rows of crops to kill the weed and grass by flaming the leaves, the cultivated plant being tall enough to escape exposure of its leaves to the flame and the adjustment of the intensity of the heat and time of exposure such that the stems are not affected. The equipment tested is mounted on a two-wheel sulky. It includes a 20-gall. tank for Diesel or tractor fuel; a 45-cu. ft. air compressor, and a 6-h.p. air-cooled gasoline motor. Attached to the front end of the drive shaft of the compressor is a fuel pump. Above each burner is attached a small tank, from which fuel is slowly fed to a pilot light. The height of the burners above the ground is controlled by sleds, one for each burner. The burners are adjusted so that two flames hit the rows from opposite sides and in tandem. Two rows are flamed at one time, four burners being employed. The burners are controlled by regulating valves on the air and fuel lines. These valves are located near the burners. The person who regulates them either walks behind the equipment or rides on the platform of the sulky. From cost and yield data and observations of the effect of the weed-killing treatment in the field, it was considered that this phase of the mechanization of cotton production is practical. A new set of equipment, eliminating some failings of the form used in the experiments here reported, was designed and built for testing during the 1944 season, and is illustrated.

241. Cotton Nectar in Relation to Bee Activity and Honey Production. By G. H. Vansell. (*J. Econ. Ent.*, August, 1944. *Bibliog. Agr.*, U.S. Dpt. Agr., December, 1944. Item 26841.)

242. Cultivated Plants of the Past, Present and Future. By M. B. Crane. (*Endeavour*, **2**, 1943, p. 111. From *Pl. Bre. Abs.*, xiv., **4**, 1944, p. 274.) An historical review is presented of the ways in which new varieties of plants have arisen. Selection of gene mutations (including somatic mutations giving rise to chimeras), chromosome doubling, hybridization, and combinations of these methods are treated in turn.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

243. Cotton Cellulose: Deposition. By W. Wergin. (*Planta*, **32**, 1942, p. 535. From *J. Text. Inst.*, October, 1944, A448.) The colourless particles that appear in the cytoplasm of cotton hairs are not cellulose structures from which the fibrils are formed by linear extension as stated by Farr, but plastids in which by special treatment starch can be demonstrated. Microscopy also shows that these plastids are not in contact with the fibrils as if the better to be incorporated into the cell walls; it is more likely that the formation of cellulose takes place at the walls.

[*Cf.* Abstrs. 246, 528, Vol. XIX. of this Review.]

244. The Viscosity of Dilute Solutions of Nitrocelluloses derived from Chemically Modified Cotton Celluloses of Various Types. By T. Brownsett and G. F. Davidson. (*J. Text. Inst.*, January, 1945, T.1.) The relations between the viscosity and the concentration of acetone solutions of nitrocelluloses derived from hydrocelluloses, dichromate oxycelluloses, and periodic acid oxycelluloses, have been investigated over the concentration range 0–0·25 per cent. The viscosity-concentration relation is not the same for the derivatives of all three types of modified cotton cellulose. If, at a very low standard concentration, a nitrated hydrocellulose has the same relative viscosity as a cellulose nitrated after oxidation with periodic acid, the relative viscosities of the two products are not the same at a higher concentration, the derivative of the oxidized cellulose then having a greater viscosity than the derivative of the hydrolyzed cellulose. As an explanation of this result, it is suggested that the degree of association of nitrocellulose molecules of a given average chain-length, and

hence the viscosity at a finite concentration, is influenced by chemical changes—other than depolymerization—resulting from the oxidation of the cellulose with periodic acid. When dichromate is the oxidant, there is only a slight difference between the viscosity-concentration relations for the nitrated oxy- and hydro-celluloses. The relation between viscosity and concentration for all three types of nitrocellulose is satisfactorily represented by the equation $\log (\eta_{sp}/c) = \log [\eta] + mc$, where η_{sp} is the specific viscosity, c is the concentration, $[\eta]$ is the intrinsic viscosity, and m is a constant. The qualitative behaviour recorded above is expressed formally by the fact that within a series of nitrocelluloses derived from a given type of modified cellulose m increases with $[\eta]$, but the relation between m and $[\eta]$ varies from one type of modified cellulose to another. In support of the suggestion that oxidation of cellulose with periodic acid leads to nitrocelluloses of relatively high degree of association in acetone solution, it is shown that under certain conditions the progressive oxidation of a cellulose material with periodic acid results in a progressive *rise* in the viscosity of the derived nitrocelluloses.

245. Cotton: Effect of Paired Reactions on Capillarity. By P. P. Viktorov. (*Tekstil. Prom.*, **4**, 4, 1944, p. 9. From *Summ. Curr. Lit.*, xxv., **2**, 1945, p. 30.) In substituting caustic soda in the process of bleaching textiles it was observed that the physical changes occurring in the fibre do not become apparent until after another chemical has acted on the fibre. This combined action was noticed with caustic soda and hypochlorite, with mineral acid and soap, and with mineral acid and hypochlorite. This phenomenon is referred to as "paired reactions of combined action." To study their effect on the capillarity of cotton fibre the following "pairs" were investigated: (1) water and benzene, (2) sulphuric acid and benzene, (3) water and soap, (4) sulphuric acid and soap, (5) water and hypochlorite, (6) sulphuric acid and hypochlorite, (7) Kontakt and hypochlorite, and (8) a mixture of sulphuric acid with Kontakt and hypochlorite. Pairs 1, 2, 5, 6, 7 and 8 were studied in the order of reagents given and in reversed order. The measure of capillarity was the height of ascent of an eosin solution through the warp of the test pieces. Details of procedure are given and the results are tabulated. Pairs 1 and 5 produced no capillarity. Neither of the members of pair 2 caused capillarity, but their combined action, regardless of the order, did induce capillarity. In pairs 3 and 4, a 0·1 per cent. soap solution had no effect, but 0·5 per cent. solutions were effective regardless of the order. Of pair 6, neither the acid nor the hypochlorite was effective alone; combined they caused the eosin to rise regardless of order. Pairs 7 and 8 behaved as 6. Pair 8 gave the best results in regard to evenness of rise of eosin and the uniformity of colouring. The combined action of an acid and bleaching solution is utilized in textile treatments.

246. Variation in Copper Number, Cuprammonium Fluidity and Fibre Strength of Cotton Stored under High Humidity. By C. Nanjundayya. (*Tech. Bull. Ser. B, No.* 32, Ind. Cent. Cott. Comm., 1944. Price: As. 8.) Changes produced in the cotton fibres of Surat 1027ALF (1940-41) raw, dewaxed, and depectinized, when stored for four months over a high humidity (97 per cent. R.H.) and a temperature of 33½° C. ± ½° C. have been studied, and the following conclusions are presented:

Raw cotton (uncleaned) when stored under the conditions specified above, undergoes a marked change in copper number, insignificant increase in fluidity, and considerable loss in fibre strength. These effects were also shown on a smaller scale by a hand-cleaned sample of the cotton stored under the same conditions. In regard to dewaxed and depectinized samples of the same cotton, there is little or no change in fibre strength and fluidity, while the fall in copper number is appreciable. There is a progressive increase in the moisture content of the raw sample (uncleaned). A comparison of the moisture content of the four samples after three months of storage shows that the non-cellulosic matter of the cotton fibre and the products of degradation may be more hygroscopic than cellulosic. The high copper number of raw cotton mainly due to non-cellulosic substances, which undergo a continual change under the conditions of storage tried in the experiments. Non-cellulosic substances,

especially the pectins, do not influence the cuprammonium fluidity of cotton. While chemical tendering lowers both strength and viscosity, microbiological tendering has little effect on the latter but adverse effects on the former.

247. Fibres: Fine Structure and Properties. By K. Hess. (*Textilberichte*, **24**, 1943. From *Summ. Curr. Lit.*, xxiv., **20**, 1944, p. 469.) A discussion of molecular size, structure and fibre properties, strength of synthetic fibres and comparison with natural fibres, the natural formation of the cotton hair and optical-microscopic and electron-microscopic examination of natural cellulose fibres.

248. Cotton Fibre, Yarn and Fabric: Testing. By J. A. Sutton. (*Ind. Text. J.*, **54**, 1944, p. 400. From *Summ. Curr. Lit.*, xxv., **5**, 1945, p. 111.) The writer gives a number of miscellaneous notes arising out of his experience of working to the requirements of the Supply Department of the Indian Government. (1) Immature fibres adversely affect the absorbency of surgical cotton. (2) The single-thread breaking load of yarn multiplied by 115 gives the approximate lea test result. (3) The breaking loads of 2- and 3-fold yarns are roughly 2¼ and 4½ times the single-thread strength. (4) For plain, cellular and hopsack weaves, cloth strength is about 5 per cent. higher than the breaking load of the yarn multiplied by the number of ends. (5) In braided cords, the core yarn does not add to the strength unless it is itself of braided structure.

249. Vertical Cotton Opener: Curling Action on Fibre. (*Cotton*, U.S., **108**, 7, 1944. From *Summ. Curr. Lit.*, xxiv., **21**, 1944, p. 492.) The writer proffers answers to the question " Does the vertical (Creighton) opener curl the cotton as it is swirled around while passing through the conical beater ?" He claims that the Creighton opener is a more effective machine for cleaning than for opening, so that the position of the machine in the blowroom sequence is the ruling factor. He suggests as a satisfactory sequence: six blending feeders (two converted from a tandem feeder and two from a bale breaker), delivering 250-275 lb. of cotton per hour to a blending apron, a vertical opener, tandem lattice openers, and a Centrif-air machine. The action of the vertical opener is discussed and hints are given on its maintenance.

250. Fibre Identification Stains: Effect of Textile Finishes. By B. Norwick. (*Ind. Eng. Chem., Anal. Edn.*, **16**, 1944, p. 274. From *Summ. Curr. Lit.*, xxiv., **18**, 1944, p. 422.) Cotton dried with formaldehyde and a trace of acid, moistened with ammonia, and then heated either in an oven or in an organic liquid such as lauryl alcohol, quickly loses its ability to pick up blue from the stain and shows first reddish shades and then yellows. Drying cotton with glyoxal gives similar results. The presence of melamine on cotton causes the latter to pick up yellow.

251. A Method for Determining Mixtures of Shirlan and *p*-Nitrophenol in Rot-Proofed Cotton. By F. Fancutt and M. S. J. Twiselton. (*J. Soc. Chem. Ind. Lond.*, lxii., **11**, 1943. From *Rev. App. Mycol.*, xxiii., **9**, 1944, p. 352.) Details are given of a method for determining the quantities of shirlan NA and para-nitrophenol in cotton fabrics and the like, used in the manufacture of railway waggon sheets, which have been treated against rotting with mixtures of these two substances. Both are estimated colorimetrically by employing the indophenol reaction which occurs between shirlan and dimethyl-para-phenylenediamine and between para-aminophenol and ortho-cresol, respectively.

252. Cotton, Wool, and Dyes: Effect of High Temperatures. By H. J. Henk. (*Spinner u. Weber*, **60**, 11, 1942. From *Summ. Curr. Lit.*, xxiv., **20**, 1944, p. 468.) Cotton withstands temperatures up to 300° for short periods, but chars completely at 120° after several months. At 80° there is a decrease in elasticity and dye absorption: at 180° the elasticity has dropped 50 per cent. and the dye absorption becomes nearly zero. Water absorption and fluorescence change similarly with heating. Wool is damaged by brief heating to 150° and by prolonged heating to 50°. Substantive dyes are decomposed completely at 270°; Naphthol AS dyes, only above 300°. Superheating on driers should be avoided, particularly with fabrics that have been impregnated with chlorides or sulphates.

253. Modern Cotton Bale Opening and Mixing Room. By S. Dinshaw. (*Ind. Text. J.*, October, 1944, p. 36.) Describes its planning and essential features.

254. Cotton Bale: Sampling. By J. S. Jenkins. (*Text. World*, **94**, 5, 1944, p. 150. From *Summ. Curr. Lit.*, xxiv., **18**, 1944, p. 415.) The writer criticizes Mitchem's suggestion for the official sampling of cotton, and points out that (1) considerable variations might be found in the judgments of grade and staple by different licensed classers, (2) spinning value cannot always be expressed in terms of grade and staple, and (3) there are in practice a great variety of private understandings between spinners and brokers as to the characters required in their cotton.

[*Cf.* Abstr. 478,Vol. XXI. of this Review.]

255. Weak Places in Cotton Fabrics. By F. Kendall. (*J. Text. Inst.*, September, 1944, T117.) Describes a weakness produced in cotton fabrics by defective conditions during loom stoppage, and how this may be obviated.

256. Observations on Soil Burial Procedures. By E. C. Bertolet. (*Amer. Dyest. Rptr.*, xxxiii., **1**, 1944. From *Rev. App. Mycol.*, xxiii., **9**, 1944, p. 310.) In recent trials 12·29 oz. duck containing 0·95 per cent. pentachlorphenol and resistant to fire, water, and weather was buried at depths of up to 4 in. for as long as six weeks without loss. When the same stuff was exposed to four months' weathering out-of-doors, followed by 14 days' soil burial, it lost 30 per cent. of its tensile strength. Water-repellent duck Nos. 4, 6 and 10, vat-dyed olive-drab No. 7, containing 0·46, 0·32, and 0·28 per cent. copper, respectively, were buried for as long as six weeks without loss, while water-repellent olive-drab No. 4 9·85 duck, containing 1 per cent. dihydroxydichlordiphenylmethane, survived three weeks' burial with no loss of strength, both before and after leaching. Promising results were also obtained by the application of 0·75 per cent. phenyl mercuric triethanolamine lactate to water-repellent 9·85 and 12·29 oz. camouflage printed duck for use in jungle equipment, which withstood seven days' soil burial in a satisfactory condition; the data relating to longer periods of exposure were inconsistent, and actual service tests are necessary to establish the utility of the treatment.

257. Cotton Goods: Testing. By F. H. Thies. (*Klepzig's Textil-Z.*, **45**, 1942. From *Summ. Curr. Lit.*, xxiv., **20**, 1944, p. 470.) Methods suitable for the industrial laboratory for determination of strength, determination of carbon and nitrogen, testing for oxycellulose, and investigation of the course of industrial processes are discussed.

258. Quantitative Determination of Extractable Gossypol in Cottonseed and Cottonseed Meal. By C. H. Boatner *et al.* (*Indus. and Chem., Analyt. Ed.*, 16, September, 1944. From *Bibliog. Agr.*, U.S. Dept. Agr., November, 1944. Item 23802.) Describes a spectrophotometric method.

259. Cotton Linters: Degradation: Determination. By R. Béha. (*Ind. Text. J.*, **58**, 1941, p. 335. From *Summ. Curr. Lit.*, xxiv., **18**, 1944, p. 422.) Methods are described for determining α-cellulose, copper number, methylene blue absorption and alkali solubility. A high consumption of methylene blue occurs with a large content of lignified fibres; raw cotton has a high methylene blue number. Markedly degraded fibres show a high alkali solubility. There is a direct relationship between the copper number and the α-cellulose content.

260. Preventing Cotton-press Damage. (*U.S. Dpt. Agr. Leaflt.* 241, 1944. From *Exp. Sta. Rec.*, **92**, 1, 1945, p. 122.) During the pressing of cotton at gins overweight and irregularly packed bales cause undue stress on the tramper and press and result in costly and untimely breakdowns. The bales are also difficult to handle and load for transportation from the gin to the warehouse. . . . It is suggested that cotton growers should send to the gin only quantities of seed cotton that will produce bales weighing from 450 to 500 lb. The ginner can divide lots of seed cotton on wagons or trucks in such a way as to gin uniform-weight bales when there are two or more bales from the same farm, and he can encourage the grower to provide some kind of a partition for keeping cotton for each bale separate on the wagon or truck. During ginning, the lint must be evenly distributed in the press box in order to prevent rolling or heavy-sided bales. Such bales result primarily from faulty action of the tramper and lint-slide kicker. The kicker speed and action should be adjusted to synchronize with the action of the tramper and give uniform distribution of the

cotton within the press box. Since the moisture content of cotton varies throughout the ginning season, the kicker should be watched closely and changed from time to time to meet varying conditions. A new design of press-box mechanism, recently developed at the U.S. Cotton Ginning Laboratory, Stoneville, Mississippi, primarily to avoid the formation of dog ridges in gin bales that cause the bales to cut during compression, has been found to be effective in providing uniform distribution of the cotton through the bale box. The mechanism consists of two prismatic plates, one for each side of the box, hinged and pivoted for rotation within an opening along the upper part of the sides of the press box, and means for rotating the plates into horizontal position to retain the cotton in the bale box during the tramping operation, and to return the plates to vertical position during the pressing period. Some description of this device is given and its use is illustrated in a drawing.

261. Mill Conditions. (*Text. Mnfr.*, December, 1944, pp. 513, 534.) The "Dust in Cotton Card-rooms Conference," organized by the Textile Institute, was held in Manchester on November 18 last. It constituted a very worthy effort on the part of the Institute to enable the technologists to discuss the subject with the medical profession, the scientists, the factory inspectors, the ventilating engineers, and the textile machinists. It is a sign of the determination of the cotton industry to make progressive improvements in all its working conditions. A Working Conditions Improvements Committee has been set up by the cotton employers' federations, with the assistance of the industry's scientists and the factory inspectors. Four new sub-committees will concern themselves with dust in card-rooms, ventilation, lighting and general amenities, the reduction of noise, air conditioning, the wider spacing of machinery, fencing, and mule spinners' cancer.

At the Conference the following four papers were presented; they were not intended to be exhaustive, but to serve as a basis for discussion of the subject: "Byssinosis: The effect of card-room dust on operatives" (Prof. F. E. Tylecote, M.D.); "The measurement of atmospheric pollution" (A. R. Meetham, M.A.); "Extraction of dust by opening machinery" (H. A. H. McGill, B.Sc.); "Ventilation in relation to dust in card-rooms" (H. S. W. Martin, M.I.H.V.E.).

262. Lancashire Cotton Mill: Modernization. By A. Draper. (*Text. Wkly.*, **35**, 1945, p. 306. From *Summ. Curr. Lit.*, xxv., **5**, 1945, p. 107.) A report of an address giving a concise account of desirable (mostly available) improvements in opening and cleaning, carding, drawing, spinning, warp and weft winding and beaming, sizing, doubling, and weaving.

263. Modernizing an Existing Cotton Spinning Mill. By J. Buckley. (*Text. Mnfr.*, 1944, pp. 207, 253, 299.) An account, furnished with diagrams and illustrations, of the machinery and lay-out suggested for the modernization of an existing cotton spinning mill by the introduction of "combined operations" comprising single-process lapping, the lap drawing system, high-draft speed frames, and high-draft ring spinning frames.

264. Cotton Spinning Mill: Reorganization. *Text. Rec.*, November, 1943; January-August, 1944. From *Summ. Curr. Lit.*, xxiv., **1**, 1944, p. 2; xxv., **1**, 1945, p. 3.) A continuation of previous articles. IV. Discusses the influence of large-package spinning on ring spindle design, driving and lubrication, and the importance of the quality of bobbins. V. Reviews and classifies the auxiliary motions of the ring frame. VI. Deals with flyer frame processes and tabulates the machinery and labour required on ordinary and high-draft (Howard and Bullough) systems. VII. Reviews the twin-sliver and lap drawing systems. VIII. Discusses the importance of combing, and reviews recent developments in the machines. IX. Deals in the same way with carding. X. and XI. Describe modern blowroom systems and discuss problems created by increasing the density of cotton bales. XII. Deals with the dust problem and the single-process system of opening. XIII. Gives a summary of the main requirements for the modernization of cotton spinning mills.

[*Cf.* Abstr. 257, Vol. XXI. of this Review.]

265. CONTINENTAL COTTON SPINNING MILLS: ORGANIZATION. By O. Glaessner. (*Text. Wkly.*, **34**, 1944, p. 962. From *Summ. Curr. Lit.*, xxv., **3**, 1945, p. 50.) A report of a lecture on typical Continental mill practice.

266. COTTON MILLS: LIGHTING. By T. A. Gooch. (*Text. Wkly.*, **34**, 1944, **35**, 1945. From *Summ. Curr. Lit.*, xxv., **3**, 1945, p. 62.) A lecture in popular vein on the physical basis of illumination, the level of illumination desirable for specific tasks, modern fluorescent tube lighting, and problems of colour rendering. A discussion is reported.

267. THE PAST, PRESENT, AND FUTURE OF COTTON SPINNING MACHINERY. By G. H. A. Sington. (*J. Text. Inst.*, February, 1945, p. 13.) An address delivered in November last giving an account of the machines in use in the spinning industry well over one hundred years ago; the improvements that have been effected since that time; and what may be achieved in the years to come. A discussion followed.

268. COTTON SPINNING MILL: MACHINERY IMPROVEMENTS AND SPINNING COSTS. By G. Clapperton. (*Text. Wkly.*, **34**, 1944, p. 732. From *Summ. Curr. Lit.*, xxiv., **23**, 1944, p. 553.) A report of a lecture. The various machines of the card and spinning rooms are reviewed, and improvements made during the past few decades are mentioned where possible. The wage costs of spinning 46's doubling weft are analysed to show how small is the scope for radical changes. The figures are, per pound of yarn: up to carding 0·345d., combing 0·378, drawing 0·136, slubber 0·120, intermediate 0·266, rover and jack frame 0·469 (total for cardroom 1·714), mule spinning 2·279, ring spinning 2·195 (total to yarn stage, mule 3·993d., ring 3·909d.).

269. SEMI-COMBED COTTON SLIVER: ADVANTAGES. By S. Dinshaw. (*Ind. Text. J.*, **54**, 1944, p. 392. From *Summ. Curr. Lit.*, xxv., **5**, 1945, p. 106.) The writer sums up the advantages of semi-combing over double carding for increasing spinning quality, and indicates how to set the Nasmith comber to achieve high production when extracting only about 5 per cent. of waste.

270. HIGH DRAFTING IN COTTON SPINNING. By J. Noguera. (*Text. Mnfr.*, December, 1944, p. 546.) A discussion of the subject under the following headings: Limits of drafting; Quality and " through-put "; Tensors; Weighting; Speed frame; Compound drafting; Yarn quality.

271. SPINNING PROBLEMS: DISCUSSION. Textile Operating Executives of Georgia. (*Text. World.*, **94**, 7, 1944. From *Summ. Curr. Lit.*, xxiv., **21**, 1944, p. 493.) Replies to a questionnaire from a number of mills are reported on the following topics: (1) *Humidities in high-draft spinning:* A common figure is 55 per cent., but figures as high as 65-70 are also reported. (2) *Female doffers:* Few mills report satisfactory experience with female doffers. (3) *Synthetic products for roller covers:* Several mills report favourably but recommend revolving front clearers to obviate " eye-browing." (4) *Scavenger rollers:* A variety of preferences are expressed for plush, paper, and blue denim covers. (5) *Bobbin building:* Various types of winding and bunch buildings are discussed.

[*Cf.* Abstr. 258, Vol. XXI. of this Review.]

272. USES AND ACCURACY OF COTTON SPINNING TESTS ON 60-GRAM SAMPLES. By H. A. Hancock. (*J. Text. Inst.*, January, 1945, T10.) A technique for spinning 60-gram samples on standard cotton machinery is described. The sources of variation in this two-ounce " micro spinning test " are analysed into those arising from (*a*) real differences between the cotton under test, (*b*) spinning machine errors, and (*c*) variations due to imperfect sampling of the cotton. Purely spinning errors are shown to be surprisingly little affected by reducing the sample weight from a kilogram down to 60 grams. Numerical estimates are given for the unwanted errors, and for their relation to the genetic variances involved, in a few cases of general interest. Although designed primarily for its economy in cotton, a fourfold increase in speed of working turned out to be as great an asset of the micro test. It is in fact used mainly for its advantage in speed on samples of which there is enough cotton for a full-scale spinning. In such cases the sampling error can be made

negligible, because 60 grams can be representative of a much larger bulk. Direct answer by the spinning-test now supersedes the need for inferences based on lint measurements. An important application of the test is to commercial crop control and the elimination of deteriorated or contaminated seed. All seed cotton intended for sowing-seed in the following crop is required by Egyptian law to be tested in advance. For the long-staple varieties, acceptance or refusal of the lots for sowing is now on the basis of lint quality. Spinnings are carried out at the Government station on mass production lines, and the method is believed to mark a big advance in crop control for quality. All the long-staple cotton of Egypt is now grown directly from seed whose lint has passed the spinning standards, lot by lot.

273. Cotton Fibre: Spinning Quality Tests. By A. C. Walters. (*Text. World*, **94**, 7, 1944. From *Summ. Curr. Lit.*, xxiv., **21**, 1944, p. 503.) A brief review of American methods of testing cotton staple (Suter-Webb duplex sorter, Hertel fibrograph), fibre strength (Pressley and Chandler methods), fineness (weight per unit length), cross-sections and convolutions (microscope) and alignment of micelles (X-ray angle).

274. Cotton Weaving Mill: Reorganization. By G. A. Bennett. (*Text. Rec.*, 1943, **61**, May, July, September, October, December; 1944, January-April, **62**, May, June, July, September, October. From *Summ. Curr. Lit.*, xxv., **1**, 1945; p. 4.) A series of articles reviewing modern weaving machinery and accessories, and their post-war development in the manufacturing sections of the cotton industry. Part I discusses the structure of the industry; Part II covers the need for standardization of cloth structures on the lines of the " utility " fabrics, and considers the prospects for automatic looms; Part III deals with the scope for cop-changing automatic looms as illustrated by the Northrop Model T loom, fitted with the Roper automatic let-off motion and the parallel underpick motion; Part IV reviews the chief types of shuttle-changing automatic looms; Part V describes the organization and lay-out of a weaving shed, with notes on loom driving and the training of operatives; Part VI enumerates the chief technical improvements in automatic looms and weaving; Part VII reviews the utility of multiple-shuttle automatic looms. (Certain statements are revised and challenged in the June number, p. 52.) Part VIII discusses the selection and preparation of yarn for automatic weaving. Part IX covers warp preparation and sizing for automatic weaving. Part X reviews developments in high-speed warping and winding. Part XI describes the Barber-Colman system of warp preparation. Part XII stresses the value of weft re-winding. Part XIII sums up the main requirements for post-war reorganization.

275. Textile Fibres: Damage by Light. By J. Salquain. (*Teintex*, **7**, 1942. From *Summ. Curr. Lit.*, xxiv., **21**, 1944, p. 503.) The effect of natural and artificial light on fibres and the humidity factor are discussed. Exposure of cotton to ultra-violet light alters the fluorescence, and increases the alkali-solubility and the absorption power for Fast Red Salt NB and Variamin Blue B. The formation of carboxyl groups and increase in reduction power are shown by the copper number and other tests. The chemical changes are accompanied by a weakening of the fibres. The hydrogen peroxide formed by solar rays oxidizes alcohol and aldehyde groups of cellulose to carboxyl groups and causes the formation of oxycellulose. Probably a splitting of the glucopyranose groups of the cellulose chain takes place.

276. The Drying of Textiles. (*Cotton*, M/c, 18/11/44.) Reports from the United States state that a rapid highly efficient process for the drying of textiles, using high frequency heat, has been announced by the Industrial Electronic Division. The equipment for this application is Megatherm, an easily operated, compact, electronic heating unit. Based on the principle of dielectric heat generation, which makes possible the production of drying heat directly within the water or dye vehicle proper, this high frequency heating might be a major contribution to fabric drying processes in the cotton textile industry.

277. Textile Terms and Definitions. (*J. Text. Inst.*, May, November, 1942; June, 1943; March, October, 1944.) Lists of definitions and notes approved for publication by the Textile Terms and Definitions Committee. The lists will be

reconsidered later, in the light of criticisms that might be received, before the definitions in their final form are adopted.

278. COTTON WASTE: OILING. By V. V. Laikov. (*Khlop. Prom.*, **10**, 1940. From *Summ. Curr. Lit.*, xxiv., 16/17, 1944, p. 381.) Cotton waste mixtures are oiled to facilitate spinning. A mixture of oleic acid, machine oil, soda or ammonium hydroxide, and water is used. Various oil mixtures were tested on the same waste mixture and the tensile strength of the yarn during spinning was determined. Parallel tests were made with "Verol" alone and in mixtures with the above chemicals. Verol essentially improved the quality of the yarn and was cheaper (its composition is not disclosed).

279. "GREX" YARN COUNT SYSTEM: ADVANTAGES. By A. G. Scroggie. (*Cotton*, U.S., **108**, 3, 1944, p. 102. From *J. Text. Inst.*, September, 1944, A389.) The author shows by examples the advantages of the "Grex" system in determinations of weight of yarn in fabrics of stated construction, especially when different fibres are incorporated in the warp or weft. A graph is reproduced of cotton counts from 80 down to 10 and equivalent Grex numbers from 50 up to 550.

280. THE PROBLEM OF STANDARDIZING TEST METHODS FOR MILDEW AND ROT-RESISTANT TREATMENTS OF TEXTILES. By H. D. Barker *et al.* (*A.S.T.M. Bull.* 126, 1944. From *Rev. App. Mycol.*, xxiii., **11**, 1944, p. 450.) Some of the problems connected with the highly complex operations involved in the testing of fungicides for the prevention of textile rots and mildews are briefly discussed and the following conclusions reached. Evaluation tests should determine (1) whether the protective agent possesses fungicidal or fungistatic properties; (2) the degree of its resistance to leaching, photochemical action, ionic adsorption, and other weathering agencies, the prolonged action of which tends to reduce the concentration on the fabric to a value permitting the growth of deleterious micro-organisms; and (3) the amount of the antiseptic required to assure practical service life for the treated materials. In contrast to the detailed investigations necessitated by these sensitive procedures, acceptance tests should be based on rapid routine methods, capable of detecting "spotty" application or confirming the correctness of the treatments given. One possibility felt by the writers to have been insufficiently explored is the substitution of simple quantitative chemical for biological tests as acceptance procedures.

281. A MILDEW-PROOFING TREATMENT. By C. F. Greeves-Carpenter. (*Text. Mnfr.*, February, 1944, p. 82.) The problem of immunizing materials against the mildew-forming bacteria and fungi—one of the most serious problems of the textile industry—has engaged the attention of Dr. F. J. Sowa in the United States. He claims to have succeeded in developing a series of chemical formulations which are now protecting many millions of yards of camouflage cloth, mosquito netting and other military fabrics against infection by *Aspergillus* spp., *Chaetomium globosum*, *Clostrideum welchii*, *Penicillium digitatum*, *Scopalariopsis brevicaulis*, and *Staphylococcus aureus*. The formulations are described as a group of complex organo-mercurial compounds covered by patent applications and differing radically in their structure from the common inorganic mercury salts, which tend to precipitate cumulative and toxic protein-type substances. With suitable modifications the basic formulations can be adjusted to ensure complete compatibility with all types of finishes. The process is known as "Puratized," and at present the entire output of the requisite chemicals, except for a small amount for test purposes, is limited to use by contractors who are supplying the U.S. Government with military fabrics. Various types of the process suitable for specific purposes are briefly indicated.

282. SOIL SUSPENSION METHOD FOR TESTING MILDEW RESISTANCE OF TREATED FABRICS. By M. S. Furry and M. Zametkin. (*Amer. Dyest. Rptr.*, xxxii., **19**, 1943. From *Rev. App. Mycol.*, xxiii., **9**, 1944, p. 309.) Full details are given of a method of testing mildew resistance in treated military fabrics of various types by a method involving the inoculation of strips of the materials with a suspension of composted soil and their incubation for 10-14 days in the synthetic medium of Greathouse *et al.* The soil used for the suspension was shown by inoculation tests on cotton duck to contain a variety of micro-organisms, of which *Chaetomium globosum*, *Metarrhizium*

sp., and a species of *Fusarium* caused complete deterioration of the fabric, colouring it yellow-grey, yellow-green, and yellow-black, respectively, while the following were responsible for 60-75 per cent. loss of strength: *Acrostalagmus albus, Alternaria, Cladosporium, Helminthosporium,* and *Papulaspora* spp., and one species of *Penicillium*; most of these moulds turned the fabric grey.

Five out of nine finishing treatments applied to 7 oz. cotton osnaburg were found to be satisfactory by the soil-suspension procedure—viz., 30 mins. immersion in copper naphthenate emulsion, 20 gm. per 100 ml. water, at 25-30° C., the same period in cuprammonium hydroxide, 10 gm. per 100 ml., same temperature; 10 mins. in a mixture of 1 per cent. lead acetate and 0·3 per cent. potassium dichromate, same temperature; and 16-18 hours in the natural dye extracts, cutch and osage orange (*Toxylon pomiferum*), both at 0·6 per cent., with copper sulphate 0·3 per cent., and the same amount of potassium dichromate, at a temperature of 100°. Two baths were given for the last three treatments. One of the other treatments, consisting of ten minutes' immersion at 100° in copper sulphate and soap (10 and 1 per cent. respectively) also afforded considerable protection, involving a loss of 25 per cent. in breaking strength compared with a maximum of 11 for the more effective procedures. In another test it was shown that a minimum of 0·5 per cent. copper in the form of copper oleate and resinate was required for adequate mildew control, as against 0·65 per cent. copper naphthenate (*loc. cit.*), the protective action of the latter, however, being more lasting.

283. Flame-, Mildew-, and Water-Proofed Cotton Fabrics: Production. By C. N. Rabold. (*Text. World*, **94**, 8, 1944, p. 90. From *Summ. Curr. Lit.*, xxiv., **23**, 1944, p. 561.) War-time developments and probable post-war outlets for them are reviewed. Flame-proofing agents mentioned include chlorinated paraffin. Among mildew-proofing agents listed as having been tried in U.S. Army fabrics is cuprammonium fluoride. Limitations of various antiseptics are stated. The advantages of the newer water-repellent finishes are discussed.

284. Quartz Fibre Micro-Balance. By C. Nanjundayya and N. Ahmad. (*Ind. J. Agr. Sci.*, December, 1943, p. 649. From *J. Text. Inst.*, February, 1945, A73.) An illustrated description of a quartz fibre micro-balance with means for adjusting the tension in the fibre and a glass capillary arm fixed across the fibre by a special aluminium clamp. One end of the arm has a needle point that travels over a graduated quadrant and the other end carries the pan for the object to be weighed. Weights of tufts of cotton fibres are tabulated as obtained on a torsion balance (range 0-5 mg.), a quartz fibre balance of the Denham type (1924; range 0-0·5 mg.) and the new balance (range 0-4 mg.). Agreement is good.

TRADE, PRICES, NEW USES.

285. Liverpool Cotton Futures Contract: Revision. By A. Bryce Muir. (*Text. Wkly.*, **35**, 1945, pp. 205, 213. From *Summ. Curr. Lit.*, xxv., **5**, 1945, p. 105.) The writer states the case for an early resumption of the normal operations of the Liverpool Cotton Market, and reports that the Liverpool Cotton Association is considering the creation of a Futures Contract that is not governed by the values ruling in the United States or any one country. The basis is "Middling" cotton of American, Brazilian, Argentinian or Russian origin, these being almost interchangeable. Similar cotton of not less than $\frac{7}{8}$ in. staple and of the grade Strict Low Middling would be tenderable on the contract.

286. On the Use of Fireproof Cotton in Bacteriologic Work. By L. J. Camagni. (*J. Lab. and Clin. Med.*, **28**, 12, 1943, p. 1475. From *Exp. Sta. Rec.*, **90**, 3, 1944, p. 319.) To avoid the disturbing and sometimes even dangerous consequences of flaming the closing wads in test tubes, use of fireproof cotton, said to be commercially available and less expensive than absorbent cotton, is recommended.

287. Preliminary Observations on the Suitability of Cotton Cloth for Covering Bales Instead of Hessian. By C. Nanjundayya and N. Ahmad. (*Tech. Bull. Ser. A, No.* 60, Ind. Cent. Cott. Comm., 1943.) India produces a fairly

large quantity of short-stapled cotton, a portion of which is consumed in the mills for textile purposes, while the utilization of the remaining quantity is a problem which has been engaging the serious attention of the technologists for some time past. At the present time when the war has considerably reduced the export trade of India in raw cotton, this problem has assumed even greater proportions. Various new uses, mostly non-textile, have been suggested in order to divert the surplus short-stapled and low-quality cottons into profitable channels, one such use being the replacement of the hessian cover of a commercial bale by a suitable cotton fabric. The principal factors governing the feasibility of using cotton cloth as a bale cover are, firstly, its suitability in comparison with hessian, and secondly, economic considerations. Hessian is normally more economical than cotton cloth, but during certain periods, as in 1939, the price of the former may exceed that of the latter; therefore the possibility of manufacturing cheap cotton cloth which could compete successfully with hessian should not be ignored. In addition, it might be possible to export cotton bale covering material to other countries, such as America, where its use is rapidly gaining ground for various reasons. The present bulletin gives the results of experiments carried out to determine the behaviour of cotton cloth, manufactured from relatively short-stapled Indian cotton, in respect of penetration of moisture and dirt, liability to attack by rust and pests like rats, white ants, etc., its serviceability under normal conditions of transit from the pressing factory to Bombay involving fairly long journeys, storage and normal handling in a Bombay godown for a period of over one year, and to compare the results with ordinary bales covered with hessian, pressed, transported, and stored under similar conditions. The re-sale value of the cotton cloth has not been taken into account by the authors, but they suggest that after proper cleaning and dyeing it may be used for curtains, bags, upholstery, etc., and even coarse wearing material. Other advantages claimed for using cotton cloth for bale covering are (1) the better preservation of the grade of cotton from the pressing factory to the consuming centre, (2) compact appearance of the bale, (3) lesser adherence of the raw cotton to the covering material, (4) smaller tare of bale cover, and (5) no admixture of small jute fibres during transit, storage, or opening of the bale.

MISCELLANEOUS.

288. British Cotton Industry: Reorganization. The Cotton Board. (*Text. Wkly.*, **34,** 1944, p. 138. From *J. Text. Inst.*, October, 1944, A450.) A statement on the advantages of amalgamations between firms in the various sections of the cotton trade, and on the extent to which such integration already exists. In spinning, more than half the capacity of the mills is controlled by 31 firms, but in weaving the proportion of small firms is very much larger. In finishing, there are many small concerns, but the export trade is more concentrated, the largest ten firms controlling 25 per cent. of the business. Only 18 per cent. of spindles and looms are controlled by " vertical " firms.

289. British Cotton Industry: Organization for Research. By F. C. Toy. (*Text. Wkly.*, **35,** 1945, pp. 60, 106. From *Summ. Curr. Lit.*, xxv., **3,** 1945, p. 71.) A report of a lecture, reviewing (1) the work of the Shirley Institute, (2) research work by individual firms, and (3) steps to increase the research-mindedness of the industry as a whole. A discussion is reported.

290. Scientific Research: Application in the Cotton Industry. By N. G. McCulloch and G. S. Hibbert. (*J. Soc. Dyers and Col.*, **60,** 1944, p. 258. From *Summ. Curr. Lit.*, xxv., **3,** 1945, p. 71.) An account is given of the work of John Mercer, and the use of science and the employment of scientists in the textile industry are discussed. It is pointed out that the earlier expansion of the traditional industries was very largely the result of linking old-established craftsman-practices to the power derived from steam, whereas the new industries have been founded on scientific research. If the traditional industries are to stem decay, they must adopt scientific methods. Progress in this direction was made in the founding of the Shirley Institute.

Differences in outlook between the scientific worker and the craftsman are pointed out, and it is suggested that, in order to facilitate the translation of the Research Association's results into industrial practice, liaison men or officers should be employed in factories or workshops, and that a spirit of enthusiasm and confidence in scientific method should be developed throughout the industry. Research opportunities for small firms and the advantages of research carried out in the same establishment as production are emphasized. Recent developments in the training of personnel in the industry are mentioned. The training of the research worker is discussed, and it is suggested that more attention should be given to technological research in this country, and that there is a need for an institution similar to the Massachusetts Institute of Technology.

291. RECONSTRUCTION IN THE COTTON INDUSTRY. (*Text. Mnfr.*, December, 1944, p. 516.) Addressing a meeting at Leeds, Sir Raymond Streat, Chairman of the Cotton Board, gave his views on the present position of the cotton industry in relation to its general policy, and also some maxims on the progressive spirit in which to face reconstruction after the war and pre-war contraction. The following are some extracts from the address:

"The main features of Lancashire's post-war problems are to reconsolidate on some new basis after the great contraction completed between the two wars, to make profits again and use them for the re-equipment which was impossible when profits could not be made, to reopen the concentrated mills and change from war products to peace products, to evolve new methods to suit the new conditions.

"There are three entirely different approaches to post-war restoration and reconstruction in industry: (i) Complete State control and direction; (ii) Private enterprise without any attempt at co-ordination; (iii) Freedom as a matter of principle both for capital and labour, but with voluntary acceptance by them of measures of guidance and co-ordination to secure national aims.

"Mr. Dalton came to Lancashire two months ago, and in effect said that the maxim would be freedom with guidance and with responsibility. He gave the Cotton Board five points by way of guidance—amalgamations; re-equipment; overhaul of merchanting organization to favour bulk orders; simplification of wage structure; double shifts. I suggested that the Government, too, must do its part, and gave Mr. Dalton five points for Government action. These were: we must be allowed to make profits and retain a fair amount; we must have good terms of access to markets for our export trade; we must have our labour returned to us in good time; we must have licences for new machinery and reconditioning; we must be free to repair our factories. . . .

"One point advocated by the cotton industry has met with considerable criticism, the desire, during the period of reconstruction, to have the right to organize minimum prices. I fully understand the doubts entertained by many about industrialists fixing minimum prices. The danger of protecting and preserving inefficient units is a real danger. The right to arrange minimum prices should not be granted without the most adequate checks and safeguards, but, following a period first of profound contraction and then of profound chaos, reconstruction cannot be accomplished otherwise than by inflicting into the situation some basic element of stability on which to build. Otherwise the implications involve hardship and suffering for the working classes. Let us agree that the goal is to dispense as soon as possible with all such artificial devices as minimum prices, but in face of our very complex difficulties do not let theoretical objections rule out a moderate, regulated, supervised use of a policy which can help to make our revolutionary plans workable. If I had to give a short list of three maxims I should say: (i) Management and ownership must use modern equipment and modern methods to the limit; (ii) Labour must facilitate experiment and change; (iii) Government policy must favour the making of reasonable profits and must not prevent by taxation substantial reinvestment of profits in modern developments. The technical aspects of policy will not of themselves suffice. We need to build on true moral and spiritual foundations and acknowledge Christian principles afresh."

292. COTTON TEXTILE MISSION TO THE UNITED STATES: RECOMMENDATIONS. [(1) *Text. Mnfr.*, **70**, 1944, p. 472; (2) *Text. Wkly.*, **34**, 1944, pp. 686, 811. From *J. Text. Inst.*, January, 1945, A50.] (1) and (2) The salient features of the official report of the Cotton Textile Mission, 1944, are summarized. Reasons for the generally higher "production per man-hour" in the United States are enumerated, and immediate and long-term suggestions are given for increasing the productivity in Lancashire mills. (3) Various press comments on the report are summarized.

293. COTTON OPERATIVES: RECRUITMENT AND TRAINING. By E. M. Gray. (*Text. Wkly.*, **35**, 1945, p. 162. From *Summ. Curr. Lit.*, xxv., **4**, 1945, p. 101.) A report of a lecture and discussion on (1) the causes of the present labour shortage in the cotton industry, (2) probable developments in the labour supply due to the new national education policy, and (3) the programme of the Recruitment and Training Centre of the Cotton Board.

294. COTTON OPERATIVES: MANAGEMENT. By M. H. Winder. (*Text. Wkly.*, **34**, 1944, pp. 910 and 958. From *Summ. Curr. Lit.*, xxv., **1**, 1945, p. 19.) A report of a lecture on modern problems of labour management and welfare work in cotton mills.

295. COTTON SPINNING MILLS AND THE TESTING OF NEW METHODS. (*Cotton*, M/c, 24/2/45.) The report of the Platt mission to the United States has, since its publication, been the subject of close study by the Cotton Board Committee to Inquire into Post-war Problems. One of the recommendations of the report was that investigations and experiments should be conducted in selected mills, and the Cotton Board Post-war Committee has so far approved of this recommendation as to pass unanimously the following resolution:

In connection with investigations and experiments in the field of new machines, new planning of machinery, new methods of mills staffing, and simplification of wage rates, the committee are particularly impressed by the length of time which is inevitably involved. The committee therefore feel an early start is vitally important, and are of the opinion that they should forthwith invite offers from the industry to make a mill or mills available for practical tests on the following understandings: (1) That the character of the new methods to be tried out receives the prior approval of a committee appointed by the Cotton Board, on which should sit equal numbers of representatives nominated by the Federation of Master Cotton Spinners' Associations on the one hand, and by the two spinning section trade unions on the other. Representatives of the textile machinery industry should be invited to collaborate in the tests by attending in the capacity of expert advisers as may be found helpful. A similar invitation should be extended to Shirley Institute. (2) That during the experiments and investigations departures may be made from existing recognized practices, providing no operative has any reduction in earnings or is obliged to work under new arrangements without right of appeal to the above committee. (3) That what is done during the tests shall be recorded in complete detail and fully reported to the Cotton Board and to the employers' and trade unions' organizations. (4) That practices in the mill should revert to normal after the tests unless the Federation and trade unions otherwise agree.

The committee intend after the experiment has been set on foot in the spinning section to turn their attention in a similar way to the manufacturing section.

296 EDUCATIONAL RECONSTRUCTION WITH SOME SPECIAL REFERENCE TO THE TEXTILE INDUSTRIES. By G. D. H. Cole. (*J. Text. Inst.*, May, 1944, p. 51.) In the Mather Lecture of 1944 the lecturer discussed the aims and provisions of the new Education Bill; the four main classes of entrants to "gainful employment," the schools from which they will be drawn, and the type of education that should be provided in the schools, particularly in the Technical and the Modern Schools. The work of the proposed Young People's Colleges, and the relation of the suggested changes in education to the textile industry, were also discussed.

297. ORGANIZATION OF SCIENCE IN GREAT BRITAIN. (*Nature*, 13/1/45, p. 42.) An interim memorandum from the sub-Committee on the Future Scope and Organization of Science in Great Britain, which has been issued by the Parliamentary and Scientific Committee, urges as an immediate measure the appointment by the Government of a

committee, with the widest powers of securing information, to review the existing position of industrial research and development in British industry, and to plan a programme (covering, say, the next five years) aimed at remedying the most important defects and gaps in that field, so far as the national interest is concerned. Such a review would involve consideration of existing national resources at home, the probable economic position of Britain in the post-war world, and the lines along which the immediate, vigorous and large-scale application of scientific knowledge is likely to yield the most fruitful results. In this connexion the sub-committee stresses the necessity for special attention to scientific research on the treatment of coal. The review would also involve investigation into the points at which British industry in general, and certain industries in particular, have failed in the past to utilize scientific knowledge, the loss to the national interest which has resulted from this failure, and the steps which can be taken to prevent the recurrence of similar failure. The sub-committee does not consider that a review of this type, involving specialized technical knowledge of a number of different industries, combined with a particular appreciation of the facts affecting the position of Great Britain in the world economy, could be adequately carried out by any existing agency. While the proposed committee should take its evidence in secret, an early and informative report is regarded as essential first as a means of bringing home to industry and the public the realities of the existing situation, and secondly, to afford a basis for settling the plan of action required to recover and maintain the industrial strength upon which our future as a nation depends.

298. SCIENTIFIC AND INDUSTRIAL RESEARCH. (*Nature*, **154**, 1944, pp. 249, 283, 311, 345, 373, 407.) A critical review of the various reports and papers discussing scientific and industrial research in this country and the United States, including " A Post-War Policy for Science " by the Association of Scientific Workers; " Problems of Scientific and Industrial Research," from Nuffield College; the symposium on the " Organization, Direction, and Support of Research " arranged by the American Philosophical Society, and including a paper by H. A. Innis on " Political Economy in the Modern State "; " The Goodenough Report on Medical Schools "; " A Scientific Policy for Agriculture " by the Parliamentary and Scientific Committee; several reports on Education, including a pamphlet on " The Development of British Universities " by Sir Ernest Simon, and the report of the British Association Committee on " Post-War University Education "; " A Framework for the Future " by a Fabian research group; " Research, Intelligence, and Administration " by Prof. Harold Laski; " Science and the Future " by Prof A. E. Trueman; " The Impact and Value of Science " by Dr. D. W. Hill; addresses by Lord McGowan and by Mr. S. Courtauld, advocating the fullest possible publication of research.

ADDENDA.

299. INDIAN CENTRAL COTTON COMMITTEE: REPORT OF THE TECHNOLOGICAL LABORATORY, 1943-44. (Ind. Cent. Cott. Comm. Price: 6 annas.) During the period under review the previous standard of the work of the Laboratory was maintained, and there was an appreciable increase in many of its activities. The services rendered to the various Agricultural Departments not only in India but also in the Belgian Congo and East Africa were continued. The total number of samples received for test was 1,514, an increase of 385 samples over the previous season. Brief accounts are included of the work carried out by the Spinning Laboratory, Technological Research, Fibre Testing, and Ginning Sections. 601 samples were spun during the year, compared with 579 in the previous season: this constituted a new record for the Spinning Laboratory. Six technological bulletins by Dr. Nazir Ahmad and other authors, 3 technological leaflets, and 39 technological circulars were published during the period under review.

300. BRITISH COTTON INDUSTRY RESEARCH. (*Cotton*, M/c, 7/4/45, p. 3.) Plans have been drafted for the extension of the Shirley Institute, the British cotton industry research centre at Didsbury, Manchester, at a cost, spread over a number of years, of £1,000,000. The proposed development includes model spinning, weaving,

and processing departments, the modernization of laboratories for cotton and rayon, library extensions, a conference hall, and exhibition rooms. The carrying out of the plans, it is estimated, would increase the annual expenditure from £120,000 to approaching £200,000 in the next five years, and the textile industry has been appealed to for an additional £30,000 a year so as to qualify for the maximum Government annual grant, if the proposed raising of this from £35,000 to £80,000 is officially approved.

301. NYASALAND: REPORT OF THE ENTOMOLOGIST, 1943. By C. Smee. (*Rev. App. Ent.*, xxx., Ser. A, 3, 1945, p. 85.) With a few exceptions, insect pests were not abundant in Nyasaland in 1943. Infestation of cotton by *Platyedra gossypiella*, Saund., was negligible, but there was a rather severe outbreak of Jassids in the Lower River and Lake Shore areas. A single individual of *Apanteles earterus*, Wlkn., was bred from a larva of *Diparopsis castanea*, Hmps., collected on cotton in North Nyasa in November. *Œcanthus brevicauda*, Sauss., was common on cotton and tobacco. *Nomadacris septemfasciata*, Serv., was again the only locust present in the Protectorate, and it bred only in the Southern Province.

302. SUDAN PLANTATIONS SYNDICATE: ANNUAL REPORT TO JUNE 30, 1944. (*E. Afr. and Rhod.*, 19/4/45, p. 774.) In connection with the notice given by the Sudan Government of its intention to terminate the Syndicate's concession in June, 1950, the report of the directors records that Mr. J. W. E. Miller, Financial Secretary to the Sudan Government, said at a meeting of the Northern Sudan Advisory Council in December, 1943: " The cotton companies have served this country well. The sincerity and the efficiency with which the boards and management have interpreted their duty in the Gezira are known and admitted by us all. Abundant testimony is readily available to the interest and sincere devotion of the inspectorate staff in the field in working for the welfare and happiness of the tenants, and it is the Government's hope that many of them will be willing to continue after 1950 under the Government the work to which they have given so much of their effort and goodwill." Tribute is paid by the Board to the work of Mr. Archdale, Manager in the Sudan, Mr. Gaitskell, his assistant, all members of the staff, and to Sir William Himbury for the benefit of his wide and valued experience.

303. UGANDA: COTTON INDUSTRY, 1944-45. (*Crown Col.*, May, 1945, p. 351.) A report from Kampala, dated March 26, states that cotton from the Buganda Province is coming in very fast, and is of excellent quality. The season ends on April 21. Sesse second quality buying starts on April 2. Eastern Province cotton is practically finished, and amounts to some 125,000 bales. Approximately another 100,000 bales are expected from other Uganda districts, making an estimated total for the Protectorate of 225,000 bales.

304. FIJI: COTTON IN 1943-44. A note recently received from the Dept. of Agriculture states that cotton growing was again restricted to the maintenance of the two varieties, Sea Island and Backcross 172. One square chain of the former was grown which yielded at the rate of 660 lb. seed cotton per acre, while $\frac{1}{4}$ acre of the latter produced at the rate of 1,064 lb. seed cotton per acre.

305. COTTON QUALITY STATISTICS, UNITED STATES, 1942-43, 1943-44. (*U.S. Dept. Agr., War Food Admin.*, Washington, D.C., 1944.) Copies of this report have recently been received. The purpose of the report is to furnish a permanent record of the quality of cotton ginned in the United States during specified periods, by States and by districts, and of the quality of the cotton in the carry-over on August 1 in each year. The term " quality " as used in the report refers to grade and staple length. For the carry-over, statistics are included on the grade and staple length of Upland and American-Egyptian cottons, and on the staple length of cottons of foreign growth on hand in the United States on August 1. The tables in the report, which contain data regarding the tenderability of cotton on contracts for future delivery, indicate only the total quantities tenderable and those untenderable.

306. UNITED STATES FARMERS AND THE VALUE OF DIVERSIFICATION OF CROPS. (*Cotton*, M/c, 21/4/45, p. 6.) Advices from the United States are to the effect that farmers of the South and South-West, having discovered the value of diversification,

are not to-day, and will not be in the future, as dependent upon cotton as in the past. The Dept. of Agriculture figures show that the proportion of total acreage planted to cotton in leading Cotton Belt States is not as great as the proportion of acreage in corn in Corn Belt States. Less than one-fourth of the crop land in ten leading cotton-growing States is devoted to cotton, and corn actually occupies more acreage in the American Cotton Belt than does cotton. No other region has made greater progress in livestock production, pastures and diversification in recent years than has the Cotton Belt. The United States Dept. of Agriculture points out that soil conservation has been developed in the Cotton South more generally and more thoroughly than anywhere else in the country.

307. French Morocco: Cotton Cultivation. (*Cotton*, M/c, 14/4/45, p. 6.) The 1944 cotton crop in French Morocco is estimated at about 4,600 bales of 478 lb. net, from 7,400 acres, compared with 5,300 bales from 7,700 acres in 1943. Nearly three-fourths of the crop is grown near the Beni-Amir irrigation project, just west of the Atlas Mountains in the central part of the Protectorate. Moroccan cotton is reported to be of high quality with a staple length averaging $1\frac{1}{4}$ ins. to $1\frac{3}{8}$ in. About 90 per cent. of the cotton acreage is owned and cultivated by Arabs.

308. Russia: Coloured Cottons Grow in Uzbekistan. (*Soviet War News*, 855, 1944, p. 3. From *Pl. Bre. Abs.*, xiv., **4**, 1944, p. 317.) It is stated that cottons with brown lint giving unfadable yarns have been produced by selection, and that their quality is well up to standard. A number of shades of green have also been produced.

309. Root Disease Fungi: A Treatise on the Epidemiology of Soil-Borne Disease in Crop Plants, and a First Exposition of the Principles of Root Disease Control. By S. D. Garrett. (Annales Crytpogamici et Phytopathologici, incorporating Annales Bryologici, edited by Dr. Frans Verdoorn, Vol. I.) (Chronica Botanica Co., Waltham, Mass.; Wm. Dawson and Sons, Ltd., London, 1944, $4.50. Reviewed *Nature*, 21/4/45, p. 467.) To the plant pathologist, at work on a root disease, there quickly comes a realization of the enormous complexity and essentially dynamic nature of his problem; the soil, its organisms, and their vagaries make a whole world. But it is a world susceptible to the methods of science, and already, in some instances at least, results based on exact observation and carefully controlled experiments have been obtained; in other instances, because of the incompleteness of experience and the insufficiency of precise data, the subject is at a more elementary stage.

As the sub-title indicates, the author has undertaken a not inconsiderable task. The many and varied aspects of root infection and of the spread of fungal pathogens in the soil have been faithfully dealt with; so, too, the effect of temperature, moisture content, texture, organic content, and soil reaction upon parasitic activity are considered in detail and clearly set forth. The latter part of the book is devoted to the ascertained facts relating to the control of root-invading fungi. It may be noted that the author has not considered it within the scope of this volume to deal with the related problems of root physiology and ecology. There can be no doubt that this work represents a close and fair review of the literature, which is extensive. As an up-to-date survey of work in a field in which he has special experience, Mr. Garrett has written a book which should be of very considerable use to all engaged on the investigation of soil-borne diseases. Due prominence has been given to the specific conceptions of this branch of botany. The author of a work such as this is necessarily limited by the contemporary state of knowledge. Because of the extensiveness of the subject and the relatively restricted number of workers engaged on it, much of the research, on the fungi of tropical soils for example, is still at an early stage of development. Generalizations based on existing knowledge must therefore be accepted with due caution. Since the work aims at an exposition of principles, and since the subject-matter is by its nature somewhat discursive, brief summaries at suitable points would have added to the usefulness of the book by rendering it more incisive.

EMPIRE COTTON CROPS FOR THE YEARS 1934–1944, EXCLUDING INDIA.

(*In bales of 400 lbs.*)

The seasons are given as covering two years (*e.g.*, 1933-1934) because in the majority of the countries named planting takes place in one calendar year and picking in the next. In a few of these countries, however (*e.g.*, Tanganyika, Cyprus, Malta and some of the West Indian Islands), the crop is harvested in the same year as that in which it is planted. In such cases the figures should be read as relating to the crop grown and harvested in the *latter* of the two years at the head of the column.

COUNTRY.	1933–34.	1934–35.	1935–36.	1936–37.	1937–38.	1938–39.	1939–40.	1940–41.	1941–42.	1942–43.	1943–44.	
(1) Anglo-Egyptian Sudan ..	157,625	296,131	248,285	332,687	331,639	331,104	292,706	319,682	295,107	354,109	222,817	(1)
(2) Uganda ..	285,986	253,242	321,348	338,391	417,179	303,893	296,672	368,898	236,370	112,849	191,870	(2)
(3) Kenya ..	6,749	8,773	15,783	22,166	19,610	9,976	11,622	15,094	12,269	5,453	6,330	(3)
(4) Tanganyika	39,009	58,540	67,369	61,783	44,643	64,106	65,314	72,766	51,017	38,309		(4)
(5) Nyasaland ..	10,713	21,006	13,730	13,908	17,358	5,276	6,526	5,376	14,392	5,552	8,450	(5)
(6) N. Rhodesia..	—	—	—	—	43	77	68	78	75	39	20	(6)
(7) S. Rhodesia ..	689	566	329	530	338	82	408	433	1,938	1,464	1,657	(7)
(8) Union of South Africa and Swaziland	2,440	2,966	1,983	3,397	1,132	747	2,061	1,857	854	584	664	(8)
(9) Nigeria ..	28,247	58,851	60,076	47,554	31,636	24,057	50,632	73,295	36,119	32,494	24,618	(9)
(10) Gold Coast ..	144	146	128	145	4	5	6	17	20	30	137	(10)
(11) Cyprus ..	1,865	5,214	2,993	4,670	2,151	1,705	1,735	722	1,589	1,661	1,341	(11)
(12) Malta ..	32	20	32	32	26	28	27	—	—	—	—	(12)
(13) Ceylon ..	92	124	293	369	355	196	261	452	430	46	11	(13)
(14) Queensland ..	21,924	17,653	16,631	10,649	11,935	15,457	10,319	14,296	12,312	8,364	7,366	(14)
(15) Fiji ..	39	29	64	65	60	7	45	38	—	—	—	(15)
(16) West Indies ..	3,618	4,720	4,565	4,676	6,196	5,636	8,492	9,312	7,450	4,555	4,099	(16)
	559,172	727,981	753,609	841,022	884,298	762,907	746,894	882,316	669,942	565,509		
	Percentage Increase 8·0	*Percentage Increase* 30·2	*Percentage Increase* 3·5	*Percentage Increase* 11·6	*Percentage Increase* 5·1	*Percentage Decrease* 13·8	*Percentage Decrease* 2·3	*Percentage Increase* 18·1	*Percentage Decrease* 24·0	*Percentage Decrease* 15·5		

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THE EMPIRE COTTON GROWING REVIEW

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ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

310. INDIAN COTTON STATISTICS. We have received from the Indian Central Cotton Committee copies of Statistical Leaflets Nos. 2, 3 and 4, 1943-44, giving information regarding the following: Stocks of Indian raw cotton held in India by the mills and the trade on August 31, 1944; receipts at mills in India of raw cotton classified by varieties; approximate distribution by staple length of Indian cotton received at mills; exports by sea of Indian cotton classified by varieties, 1943-44 season.

311. SUPPLY AND DISTRIBUTION OF THE VARIOUS TYPES OF INDIAN COTTON DURING THE SEASON 1942-43. (*Stat. Bull. No.* 13. Ind. Cent. Cott. Comm., 1944. Price: 12 annas.) A review of the 1942-43 cotton season is followed by statistical and other information concerning: Area under improved varieties of cotton from 1940-41 to 1942-43; supply and distribution of various types of Indian cotton during the twelve months commencing September 1, 1941; the Indian cotton crop of 1942-43 classified according to staple length; stocks of Indian cotton held on January 31, 1944, by mills and the trade in Madras Province; exports, etc. Various appendices are included dealing with: Bombay average prices for Broach, 1928-29 to 1942-43; Indian cotton crop classified according to staple length, 1928-29 to 1942-43; stocks of Indian raw cotton held by the mills and the trade in India on 31 August, 1939 to 1943; receipts at mills in India of raw cotton classified by varieties, 1933-34 to 1942-43; Indian raw cotton consumed in Indian States and Indian mills, 1933-34 to 1942-43; exports of Indian cotton by sea, classified by varieties, 1933-34 to 1942-43; exports of Indian cotton, and prices, 1928-29 to 1942-43.

312. SPINNING TEST REPORTS ON INDIAN COTTONS, 1929-45. By N. Ahmad and D. L. Sen. (*Tech. Circs.*, Nos. 607-8, 611-15, 617, 1945. Ind. Cent. Cott. Comm.) The circulars contain the grader's report and spinning test results for Gaorani 6, Malvi, Nanded Bani, 1943-45 seasons; the report of the Standards Committee and spinning test results for Punjab-American 4F, 1929-45 seasons; LSS, 1938-45 seasons; Jarila (East and West Khandesh), 1942-45 seasons; Jarila (Berar), 1943-45 seasons.

313. TECHNOLOGICAL REPORTS ON INDIAN COTTONS, 1944-45. By N. Ahmad and D. L. Sen. (*Tech. Circs.*, Nos. 589, 605, 609-10, 616, 618, 1945. Ind. Cent. Cott. Comm.) The particulars given include agricultural details, grader's report, fibre particulars, spinning test results, remarks.

Gaorani 6.—Yarns practically free of neps. Suitable for 35's warp.

Jarila.—Yarns somewhat neppy. Spinning performance has declined during the past four years. Suitable for 26's warp.

Jayawant (*Kumpta*).—Spinning performance rather poor in 1943-44 season. Suitable for 34's warp.

Umri Bani. Cotton would gain by being picked in cleaner condition. Suitable for 29's warp.

V.434 (*Akola*). This season's cotton is coarser and possesses lower intrinsic strength. Performance is somewhat variable. Suitable for 26's warp.

314. Bombay Cotton Annual, 1943-44. No. 25. (East India Cotton Asscn. Ltd., Bombay. Price: Rs. 3.) This is the usual authoritative compendium of all matters relating to every branch of the cotton trade. The first section comprises the Twenty-third Annual Report of the Directors of the East India Cotton Association for the season 1943-44. This is followed by numerous statistical tables of acreage, production, imports, exports, consumption, prices, stocks, textiles, Government notifications etc. The publication should meet the requirements of all who are interested in the production, distribution and consumption of Indian and Foreign Cottons, Yarn, and Cloth.

315. The Effect of Storage under certain Specified Conditions on the Quality of Indian Cottons. By N. Ahmad and A. N. Gulati. (*Tech. Bull. No.* 31. Ind. Cent. Cott. Comm., 1942. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 197.) Describes the effect of storage on certain properties of Indian cottons. The conditions of storage were (1) Bombay weather, (2) controlled humidities at room temperature and at constant temperature, and (3) controlled humidity combined with watering of the cotton. The characters studied were fibre strength, incidence of infection and shade of cotton. Tests were also made on fibre length, fibre weight per inch, and spinning quality.

316. Baroda: A New Cotton for the Mathio Tract. (*Ind. Frmg.*, June, 1945, p. 273.) In certain tracts of Ahmedabad district and southern Kathiawar a coarse type of cotton of low spinning value, commercially known as Mathio, is grown. Owing to its hardy and early maturing qualities it escapes damage due to frost, and is, therefore, popular with cultivators in the tract. Since June 1937, the Indian Central Cotton Committee has been financing a scheme at Amreli in Baroda State with the object of improving the yield, ginning percentage, and quality of Mathio. The results of field trials have indicated that the Bengal strain, C520, evolved by the United Provinces Dept. of Agriculture, is superior in yield, ginning outturn, and quality to the local Mathio cotton. Further work on Mathio has been carried out to isolate types superior to C520 from the local bulk and from crosses between Jarila and Mathio selections. One strain, S.31, has been found consistently good during the past two years. It has been named Pratap by the Baroda Dept. of Agriculture. The yield is equal to that of the controls and it is as early maturing as local Mathio. Pratap has a lint length of 0·82 ins. and a ginning percentage of 35, against 0·72 ins. and 32 respectively of Mathio, and it is capable of spinning 34s highest standard warp counts against 13s of local Mathio and 14s of C520.

317. Madras Presidency: Grades and Standards of Indian Cottons. By J. S. Ponniah. (*Ind. Text. J.*, **55**, 1944, p. 155. From *Summ. Curr. Lit.*, xxv., **9**, 1945, p. 203.) The author reviews the history of the evolution of cotton standards in the Madura and Adoni areas of the Madras Presidency by Messrs. Ralli Bros., Volkart Bros., and A. and F. Harvey, and describes the standards now established by these exporters.

318. Punjab: Cotton Industry, 1944-45. By C. K. Rasul. (*Ind. Frmg.*, May, 1945, p. 224.) The area under American cotton is estimated at 1,804,400 acres, and under *desi* cotton 688,000 acres, compared with 1,588,300 acres and 737,400 acres last year, or an increase of about 12 per cent. for American cotton and a decrease of about 7 per cent. for *desi* cotton. The crop has been somewhat spoiled by excessive monsoon rains in some parts of the province and slightly more severe attacks of jassid on American cotton, but on the whole the condition of the crop is reported to be 99 per cent. of the normal.

319. Studies in the Periodic Partial Failures of the Punjab-American Cottons in the Punjab. XII. By R. H. Dastur *et al.* See Abs. 474.

320. Fuzzy American Cotton Seed as a Safe Cattle Feed. By L. C. Dharmani. (*Ind. Frmg.*, October, 1944, p. 459.) There exists considerable prejudice among Indian cultivators against the use of American cotton seed as cattle feed, partly due to the fact that it retains a certain amount of fuzz after ginning—which is erroneously

V.434 (*Akola*). This season's cotton is coarser and possesses lower intrinsic strength. Performance is somewhat variable. Suitable for 26's warp.

314. Bombay Cotton Annual, 1943-44. No. 25. (East India Cotton Assn. Ltd., Bombay. Price: Rs. 3.) This is the usual authoritative compendium of all matters relating to every branch of the cotton trade. The first section comprises the Twenty-third Annual Report of the Directors of the East India Cotton Association for the season 1943-44. This is followed by numerous statistical tables of acreage, production, imports, exports, consumption, prices, stocks, textiles, Government notifications etc. The publication should meet the requirements of all who are interested in the production, distribution and consumption of Indian and Foreign Cottons, Yarn, and Cloth.

315. The Effect of Storage under certain Specified Conditions on the Quality of Indian Cottons. By N. Ahmad and A. N. Gulati. (*Tech. Bull. No.* 31. Ind. Cent. Cott. Comm., 1942. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 197.) Describes the effect of storage on certain properties of Indian cottons. The conditions of storage were (1) Bombay weather, (2) controlled humidities at room temperature and at constant temperature, and (3) controlled humidity combined with watering of the cotton. The characters studied were fibre strength, incidence of infection and shade of cotton. Tests were also made on fibre length, fibre weight per inch, and spinning quality.

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believed to have a choking effect on the animals—and partly due to the belief that the seed produces some heating effect and adversely affects the health of milch cows and their milk yield. The fuzzy American cotton seed as a cattle feed is, therefore, considered inferior to the *desi* seed (which has a much smaller amount of lint adhering) and usually fetches a much lower price than the *desi* seed, the difference varying from Rs. 2 to Rs. 4 per maund.

To overcome this prejudice experiments were carried out over an extended period at the Agricultural College, Lyallpur, and the general conclusion arrived at from the experiments was that there was no foundation for the prejudice against American cotton seed fed in amounts from 2 to 4 lb. per head per day to heifers and working bullocks; 4 to 6 lb. per head per day to milch cows, and 6 to 10 lb. to milch buffaloes. In spite of the warm weather at Lyallpur no ill effect whatsoever was noticed on the health of the animals, nor were they ever choked as a result of the adhering lint. The milch cows and milch buffaloes maintained their normal yield of milk and body weight. The American cotton seed, in spite of the fuzz adhering, proved superior to the *desi* varieties, and is about $1\frac{1}{2}$ times richer than the *desi* seed in digestible protein.

321. AMERICAN COTTON GROWING IN SIND. By R. Thomas. (*Ind. Frmg.*, December, 1944, p. 557.) The Punjab-American F (Foreign) types have provided the foundation stock for all cotton improvement work with Upland cottons in Sind. The parent stocks have been 289F, 285F, and 4F, all selections from the Dharwar American grown in the Punjab area during 1910-20. The selection from Punjab 289F, now known to the trade as Sind Sudhar, spins maximum warp counts of about 40's. It is established over a wide area on the left bank of the Indus, and finds a ready demand from Indian mills. 4F-98, a shorter staple variety, has become established on the right bank of the Indus. Other types imported into Sind include K.T. 25 and K.T. 23 (selections from 289F made by the author at Khanewal), N.T. and LSS. The staple length and spinning qualities of all these strains, other than LSS, are on a par with Sind Sudhar. A new American variety, M4 (Mirpurkhas), a Sind-American cotton of 289F type, is likely to become the predominant crop in Sind. The plant is short, compact, and dome shaped. It holds a high percentage of its flowers, and bolls freely. It is early maturing, relatively resistant to *tirak* (bad opening of bolls) and jassid attack, partially evades bollworm attack by its earliness, is a heavier yielder than any other 289F type, is adaptable to a wide range of soil and climatic conditions, and its opened bolls are wind-resistant and easy to pick. Seed is of medium size, slightly fuzzy and uniformly greyish-white in colour without admixture of green or black seed. Ginning percentage is higher than Sind Sudhar but lower than K.T. 25. The staple averages 0·95 in. and is regular. It spins 36-40's maximum warp counts. In 1938 a long staple cotton breeding scheme was sanctioned by the Sind Government and the Indian Central Cotton Committee, and good progress has been made in the work. The Sind Government is also paying attention to the maintenance of the purity of the cotton crop.

322. LONG STAPLE COTTON IN SIND. By R. Sankaran. (*Ind. Frmg.*, June, 1945, p. 257.) An account of trials with imported strains of cotton from Egypt and the United States carried out with a view to evolving a long staple cotton possessing an average fibre length of over 1 inch. Medium stapled American cotton strains evolved in the Punjab, namely, 4F, 289F, and 285F, were imported into Sind, and by pure-line selection two strains 4F-98 (renamed Sind-American 98) and 289F-I (Sind Sudhar) were obtained. The latter has a staple length of 1 inch. By selection within another Punjab-American type imported into Sind through private agency, the Cotton Breeder at Mirpurkhas was able to isolate another strain, M4, which entered commercial cultivation in 1940. This cotton has become increasingly popular, and has replaced Sind Sudhar in several districts owing to its higher yield, earlier maturity, and better ginning outturn. The staple length is $\frac{15}{16}$ to 1 inch. Work is being continued to evolve a cotton of a staple length of $1\frac{1}{16}$ inches and over.

323. TRAVANCORE: COTTON CULTIVATION. By O. C. Zachariah. (*Ind. Frmg.*, October, 1944, p. 479.) The soil and climate of south Travancore, especially in the taluks of Thovala, Agasteeswaram and Kalkulam, are well suited to cotton

cultivation. The area that could be put under the crop is about 20,000 acres. The local variety, called Nadan, is a more or less permanent crop lasting for a period of five years; the yield, however, is only 100 lb. of kapas per acre, staple length about ⅝ inch, and the ginning percentage less than 25. To popularize better strains the Agricultural Department conducted trials at the Aramboly Dry Crop Farm with Gadag I, M.A. II, and Co. 4, which are long stapled and produce more than 500 lb. of kapas per acre. The results of the trial were quite successful and it was concluded that the cultivation could be extended to other areas. A further trial was therefore carried out on 100 acres of land set apart from the forest reserve areas in southern Travancore. Notwithstanding a somewhat unfavourable season, this trial also was a complete success, and resulted in many ryots coming forward to take up the cultivation of the new varieties.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

324. British Cotton Growing Association. The fortieth Annual Report to December 31, 1944, states that for the third year in succession the production of cotton in the Empire (excluding India) has shown a material reduction, due in great measure to adverse weather conditions in the cotton-growing countries and the necessity for increased food production and raw materials for their own use and for the war effort. In Nigeria the greater use of cotton, owing to the impetus given to the local spinning and weaving industry through shortage of imports of piece goods and yarns, left a much smaller quantity for export. The total Empire production (excluding India) of some 490,000 bales of 400 lb. is the lowest since 1931, and is a big decline when compared with an average of over 810,000 bales in the 6-year period 1936 to 1941. The demands for food and other produce of a higher war-time priority than cotton will probably continue for a year or two, but it can reasonably be hoped that a return to a period more favourable to cotton will then be experienced.

During the season under review the B.C.G.A. (Punjab) Ltd., in addition to the Khanewal Farm, controlled large acreages in the Punjab, Sind, and Bahawalpur. Thirteen ginning factories were in operation as well as three oil-expressing mills. The cotton season was a difficult one, severe hailstorms damaging the crops, while considerable transport difficulties were experienced owing to the shortage of wagons on the railways.

325. ASIA. Ceylon: Cotton Industry. (*Cotton*, M/c., 7/7/45.) Cultivation of cotton in Ceylon has decreased sharply in recent years owing to the Government's emphasis on food crops. The island's Cotton Spinning and Weaving Company consumed 17,000 cwt. of cotton in 1943 and 16,946 cwt. in 1944. Further quantities were consumed in hand weaving. In consequence, consumers have become increasingly dependent upon foreign sources, and 8,340 cwt. of raw cotton were imported in 1942, 19,889 cwt. in 1943, and 16,697 cwt. in 1944. Approximately 60,000,000 yards of cotton piece goods are imported annually into the island.

326. AFRICA. Kenya Colony: Cotton Industry, 1943-45. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1943-44.) The cotton crop of the 1943-44 season was somewhat larger than that of the previous year. About three-quarters of the cotton was grown in the Nyanza Province and the remainder in the Coast Province. A report from the Director of Agriculture at the end of 1944 was to the effect that a reduced area had been planted to cotton in the southern parts of the Nyanza Province in 1944-45, and the crop had suffered from dry weather in the early stages. Elsewhere planting and growing conditions had been favourable, but at the time of writing the report the prospects of obtaining a reasonable yield had been jeopardised by continued heavy rain. In the Coast Province also there had been some reduction in acreage and damage from heavy rain in October. It was estimated, however, that the crop would probably approximate to that of the previous season.

327. Nigeria: Cotton Industry, 1944-46. (*Half-Yrly. Rpt. to* 31 *March*, 1945.) *Northern Provinces.*—In 1944-45 minimum prices for each cotton market were scheduled by Government after discussions with the British Cotton Growing Associa-

tion and other interests. Purchases for export were the lowest since 1931-32, and on a seed distribution of 3,956 tons the index of "bales of lint for export per ton of seed distributed" dropped to as low as 2·9 compared with 10·23 in 1939-40. Only to a small extent does this reflect a poor rainy season and short growing period. The main reason is the phenomenal increase in the internal demand for seed cotton for domestic weaving due to the present high price and inferior quality of much imported cloth. Owing to restrictions on the distribution of cotton seed in the main groundnut areas (in the interests of maintaining groundnut production for export), throughout the cotton belt the internal trade in seed cotton in local markets at around 2½d. per lb. was on a considerable scale. An indication of the present extent of this trade and local consumption is supplied from the fact that the Agricultural Government Farm and associated settlers at Daudawa, whose entire crop was marketed for export, alone produced 1 per cent. of the entire export crop of the Northern Provinces. Quality was maintained by the close attention given to grading by the Produce Inspection Branch of the Department, and to ensure a greater degree of uniformity there was an exchange of grading staff between Funtua and Gusau areas. Also, in the latter area cotton seed from Funtua ginnery is being distributed in 1945-46 to avoid the possibility that a succession of poor seasons in the Gusau area may have reduced the quality of cotton grown from seed ginned in that area.

The Botanist continued the work of selecting, breeding, and distributing seed of his better yielding strains of Allen. The strain No. 26C in field trials at Samaru in 1944 yielded 14 per cent. more seed cotton per acre than commercial Allen ex Funtua, and an even better return of lint (32·5 per cent. more than commercial Allen), owing to the higher ginning percentages of these improved strains. The distribution of seed of the Botanist's improved strains of Allen in Zaria Province was successfully continued, and in a field trial at Daudawa, Zaria ordinary seed ex 1943-44 crop yielded up to 11 per cent. more seed cotton per acre than commercial Allen ex Funtua, and also had a higher ginning percentage.

1945-46 *season.*—Arrangements have been made to distribute some 400 tons more seed for sowing in the cotton belt, including some 188 tons in the Bauchi area where none was sent last year. No increase, however, is contemplated in the cotton seed distribution in the main groundnut areas.

Southern Provinces. 1944-45 *season.*—Improved Ishan seed was issued in the Oyo, Abeokuta and Ondo Provinces. The crop was promising at the early part of the growing season, but exceptionally dry weather reduced yields seriously. The number of gazetted cotton markets was 28. The amount of seed cotton graded compared very unfavourably with the previous year up to March 31. The acute competition between firms caused middlemen to hold on to their cotton, and the difficulty experienced in grading owing to dirt and leaf trash both contributed to the small amount graded. The prices paid in Oyo Province for cotton for local weaving were a few shillings per cwt. above the export prices, and this affected the grading figures.

Pink bollworm has made its appearance in the Southern Provinces and steps are being taken to control it by means of local orders for uprooting and burning cotton debris, and by fumigation of cotton seed sent to the Northern Provinces for cattle food.

328. Progress Report on Cotton Growing for the Season 1943-44. (*Prog. Rpts. from Exp. Stats.*, 1943-44.) *Northern Provinces.*—No selection work or yield trials were carried out owing to shortage of staff and pressure of war work. Promising selections from Nigerian Allen made prior to the war were maintained in progeny rows, and others from N'Kourala from the French Sudan, Oases from Geidam, and natural hybrids of Allen with *G. punctatum* ex Kontagora. Mass selection of commercial Allen, started in 1940, was continued. Selected derivatives from D5, D8, and D30, high-yielding strains of Nigerian Allen, were multiplied and sent to Daudawa for further multiplication. Sample bales of 26C (derivative of D5) and commercial Allen grown in adjacent plots in 1942-43 were sent to England, and both the Shirley Institute and the brokers reported that 26C was as strong as commercial Allen, that the yarn was superior, and that it was valued more highly. This, taken

together with favourable reports on the strain in 1939-40 and 1940-41, indicates that at last a strain has been found that combines quality with yield. 26C yielded 60 per cent, 72 per cent., and 100 per cent. more lint per acre as compared with Standard Allen in 1939-40, 1940-41, and 1942-43 respectively.

Southern Provinces.—In recent years at Moor Plantation, Ishan cotton exhibited signs of poor vegetative growth and decline in yield. Doubts were expressed as to whether inbreeding due to continuous self-pollination since 1924 was responsible. To test this, two bulk strains of Ishan A were selected and the open (crossed) and self-pollinated seeds from them were obtained. These two strains were tested in two 4×4 Latin Squares for comparison in growth, vigour, and yield. The vegetative growth of the plants was excellent and the yield good. Statistical results showed one strain yielding significantly higher than the other, but on the average, controlled pollinated (selfed) strains did not show changes of any significance over the open-pollinated (crossed) ones; but in the poorer family the self-pollinated strain was significantly lower in yield. The rough-linted cotton selected from native farms in the Ishan districts in January, 1941 (in an attempt to evolve a rough cotton of really satisfactory growth and yield) which has since been on trial, has proved too susceptible to insect attack, and inferior to Ishan A; it has therefore been abandoned. *Helopeltis* attack was again severe during the season, but its effect on cotton in the selection plot was controlled by rigorous daily hand-picking of the pest.

329. COTTON PESTS AND DISEASES. (*Prog. Rpts. from Exp. Stats.*, 1943-44.) Jassids (*Empoasca* sp.) are the most serious pest in Northern Nigeria. Introduced varieties of cotton, *e.g.*, Acala ex U.S.A., have succumbed or shown themselves very susceptible to this pest. Hairiness is correlated with resistance to jassids, and E.31, a selection from Allen, is very hairy and immune to attack. It has a number of dead seeds per boll and is itself useless, but is kept for possible use in hybridization. Stainers attack early-planted cotton, and native cotton (*G. peruvianum*) is very susceptible. Most species of bollworm cause a certain amount of damage to cotton, and leaf-rolling caterpillars occur but cause little injury to the crop. Blackarm does not normally reduce yields of Allen cotton to any extent. Leaf-curl produced by white-fly (*Bemisia* sp.) occurs. Native cotton from Sokoto (*G. peruvianum*) is markedly resistant to it, but the otherwise promising Uganda strain S.G. 27, had to be discarded because of its susceptibility to both leaf-curl and blackarm.

330. NYASALAND: COTTON INDUSTRY, 1943-44. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1943-44.) In the parts of the country in which tobacco and cotton are grown, the latter has lost ground, because the price of tobacco has not been controlled and has risen considerably, whereas the price of cotton has been fixed at a figure which makes the crop less attractive in comparison. In those areas cotton is at a further disadvantage because at its most critical early seedling stage it is competing directly with food crops for the cultivator's attention. The last two planting seasons have been particularly difficult, and cotton has naturally been neglected in comparison with food crops, so that the output has dropped considerably in those districts. Much better returns were obtained from the Lower River area, however, than in the previous year.

The Corporation's entomologists have presented their report on the Red Bollworm position in the Lower River area. It has already been mentioned that the adoption of any of the measures of control that this work suggested as possible would necessitate a considerable change in local agricultural practices. It might indeed involve prohibiting the cultivation of cotton for one year. The Government have not yet announced their decision on future action.

331. EXPERIMENTS WITH SPECIFIC CROPS, 1943-44. (*Ann. Rpt. Dpt. of Agr.*, 1944.) *Cotton.*—The Cotton Specialist reports that the derivatives of Mz. 561 were planted in multiplication plots and in a small bulk trial for comparison with the parent bulk, Crown Land commercial U.4, two U.4×Cambodia×U.4 crosses, N.C.4, and N.C.7, and the first Crown Land U.4 selection to breed true, Crown Land-119. The final pickings showed that nine of the derivatives were significantly better yielding than Crown Land U.4, and of these four have been selected for further multiplication and

trial. One of these, T-3, had far better jassid resistance than its fellows. Spinning tests carried out by the British Cotton Industry Research Association indicated that the Mz. 561 derivatives have a better type of lint than that produced by Crown Land U.4. Yields were good, ranging from 730 lb. per acre seed cotton for the best derivative, T-3, to 567 lb. per acre for Crown Land U.4.

332. Work of the Cotton Experiment Stations, 1943-44. (*Prog. Rpts. from Exp. Stats.*, 1943-44.) Mz. 561, Nyasaland version, is proving very satisfactory and is considered an improvement on Crown Land commercial U.4. It will receive extended commercial trial. Red bollworm control was satisfactorily maintained at Domira Bay, but non-bollworm loss may merit closer examination. The benefits of early weeding of summer crop cotton were again clearly demonstrated. Precultivations, their necessity or otherwise, deserve and are receiving close attention. The experience of a real droughty year has demonstrated once more that cotton can withstand harder conditions than can the common food crops of Domira Bay. It appears possible that in the derivatives retained for planting in 1944-45 the high-yielding constituents of Mz.561 bulk have been isolated, and that there has been no loss of quality in doing so. A simple investigation of "black" or fuzzless seed tends to confirm Uganda work on this group of characters. The C.L. 20 family selected from C.L.U.4. is most promising. Its original heterozygosity has made it a good subject for re-selection. Malwa Upland, crossed with a U.4 strain, has set new high standards for jassid resistance at Domira Bay. Intensified work on this and allied families seems well worth while. There is an element of doubt regarding the utility of late-flowering types in defeating red bollworm. It is thought that work on the genetical aspects of such types will best be referred to the new Central Research Station.

333. A Report on the Status and Control of Insect Pests of Cotton in the Lower River Districts of Nyasaland. By E. O. Pearson and B. L. Mitchell. (Printed by Govt. Printer, Zomba, Nyasaland, 1945.) This report deals with the causes of the great fluctuations in production of cotton in the area of Nyasaland known as the Lower River, and is the result of work carried out by the Entomological Staff of the Empire Cotton Growing Corporation in the country since 1938.

The following is an explanation of the general layout of the report: Section I is introductory, and gives a brief description of the topographical and agricultural characteristics of the Lower River area. II. Describes the history of the crop in the Lower River and the circumstances which have led to the present concentration of the cotton crop on dry land areas, entirely dependent on rainfall as a source of moisture. III. Discusses factors other than insect pests or diseases which may possibly have caused the present low and irregular productivity of the cotton crop. IV. Deals with the general methods adopted in the survey carried out over the past five years to determine the real status and incidence of insect pest damage on the Lower River cotton crop. V. Gives a detailed analysis of cotton production and losses due to various causes measured during the survey and shows the damage to be largely due to the Red Bollworm moth (*Diparopsis castanea*, Hmps.) VI. Gives a general account of the biology of this insect, its distribution, host plants, and life history. In the Lower River it is entirely confined to cultivated cotton. VII. Describes the annual cycle of the pest on the Lower River, and shows the damage to the cotton crop to be related to the cyclical fluctuations in the bollworm population. VIII and IX. Show how these fluctuations in bollworm population are related to the number of moths on the wing at different times of the year, and explain how the multiplication of the pest in the crop is carried out by means of successive generations of short-term pupæ, whilst the carry-over of the insect from one cotton season to the next is accomplished by means of long-term pupæ which on emergence give rise to the carry-over moth flight, the origin and structure of which is analysed. X. Deals with attempts to discover the factor which induces the formation of long-term pupæ. XI and XII. Deal with the duration of the long-term pupal period, and show how this can be accelerated, retarded, or even indefinitely prolonged by the temperature to which pupæ are exposed in the soil. The whole observed character of the carry-

over moth flight is interpreted in the light of the experimental results obtained. XIII. Discusses the various possible methods of control of Red Bollworm, and shows that the only logical approach is that directed against the carry-over moth flight, as being the weakest point in the insect's life cycle. Two alternative methods of doing this are outlined: (*a*) limitation of crop production to the time of year when a minimum of long-term pupæ are produced, (*b*) the extension of the close season so that long-term pupæ complete their emergence and the resulting moths die before food is available from the new crop. Certain subsidiary measures are also discussed by which effective emergence of long-term pupæ may be diminished. XIV. Discusses the bearing on other insect pests of the two principal methods of controlling Red Bollworm, and shows that so far as jassid and stainers are concerned, no insuperable difficulty would arise. XV. Reverts to the first of these methods which shows most promise of Red Bollworm control under present-day conditions in the Lower River, when the crop is necessarily a purely rain-grown one. The results of some field experiments are given to show how the principal difficulties in the way of adopting this control may be overcome. XVI. Discusses the possibilities of preparing the way for this chosen method of control by the initial clean-up of the whole area by putting it out of cultivation for one season.

334. Southern Rhodesia: Work of the Cotton Breeding Station, Gatooma, 1943-44. (*Prog. Rpts. from Exp. Stats.*, 1943-44.) Weather conditions were bad and for the second season in succession there was too much rain for the cotton crops in general, but the results were better than anticipated. There was less staining of cotton than usual, and the crop was one of the cleanest on record. The new strain 9L34 has been put into commercial cultivation. It is considered a superior type to its predecessor 9L18, and has better lint qualities. It is doubtful, however, whether the yield will be higher than 9L18. Cottons descended from the 1937 Gatooma crosses are yielding better than any others, but their lint is mostly coarser and shorter, and the plants grow too tall and rank, according to existing ideas, though there is doubt as to whether these ideas are sound and may not need modification. Barberton crosses grown in observation lines mostly fared badly owing to poor soil conditions and severe attack of Sudan bollworm, but some produced lint of very good staple and character. Acknowledgment is made of investigations carried out at the Tobacco Research Station by Mr. R. W. Jack on root knot nematode susceptibility of 9L34 cotton.

335. South Africa: Work of the Cotton Experiment Station, Barberton, 1943-44. (*Prog. Rpts. from Exp. Stats.*, 1943-44.) Weather conditions during the season were good, and growth and yields of cotton at Barberton were very satisfactory, and excellent progress was made in the work generally. The chief object of the breeding work is to produce a type of cotton thoroughly suited to short-season conditions, highly resistant to jassid, and giving lint of substantially higher spinning quality than can be obtained inside U.4. In the crosses now on hand, U.4 and M.U. 8 have been used as parents to bring in hairiness and good field characters, the high quality of lint being derived from several *hirsutum* varieties and also the *barbadenses*, Sea Island and Egyptian. It is too early yet to say which are the most promising. The U.4 × Cambodia crosses form a separate group, originally intended for the improvement of U.4 hairiness. Their excellent early promise has been fully maintained in a variety trial this year and their spinning test results are awaited with interest. If their lint proves satisfactory and they maintain their good record in the coming season, there will be every reason to hope that the best of them will be a decided improvement, for general cultivation in the area, over the best U.4 strains.

A critical examination is in progress of the relation between hairiness and jassid-resistance. The past two seasons' results have demonstrated beyond any shadow of doubt that in these conditions, and in the wide range of varieties investigated, an extremely close connection exists between leaf-hairiness and jassid-resistance. All the results so far obtained suggest that the hairiness itself causes the resistance. The evidence obtained shows clearly that hairiness of stem is not essential for even a high degree of resistance. This also appears to hold true for hairiness of petiole, so

far as the available evidence goes. The results reported for leaf-hairiness are based on lamina only, this being chosen for the sake of convenience. The degree of importance attaching to hairiness of midrib as compared with that of lamina has not been thoroughly examined, but will form one of the main subjects of investigation in the 1944-45 season. A matter of particular interest is the gradual development of hairiness in the young plant. This means that a variety classed as highly resistant may be severely damaged if exposed to a heavy jassid population whilst still young, before its hairiness has developed appreciably. It is possible that a critical examination of some of the conflicting records on jassid resistance might show that this factor has been responsible for seeming anomalies. The work on hairiness and jassid-resistance has not by any means reached a final stage and will be continued.

336. Swaziland: Cotton Industry, 1943-45. (*Ann. Rpt. Vet. and Agr. Dpt.*, 1944.) *Cotton industry* 1943-44. A report by Mr. H. Hutchinson is to the effect that at the beginning of the season there were only about 20 experienced native growers of cotton, who, in spite of the general concentration upon maize production resulting from the serious food shortage of the previous season, had found time and place to plant a certain area to this crop. They were undoubtedly primarily attracted by the expected cash return, but the value of cotton as a drought resistant, witchweed-immune, rotation for maize had also begun to dawn upon them. Their plots varied in extent from one-fifth to almost five acres. The season was favourable for cotton production. Insect pest attack and plant disease were slight. The weather was generally dry, but good rains in February and early March stimulated heavy fruiting, and subsequently dry weather allowed the seed cotton to be picked clean and undamaged. Good yields of good quality seed cotton were obtained. The largest producer with a total area of 4·8 acres obtained an average yield of 393 lb. per acre; another produced 1,267 lb. at an average of 595 lb. per acre, while a third, with only one-third of an acre had a yield at the rate of 816 lb. per acre. These were highly satisfactory yields for native cultivation. The seed cotton was purchased from the native growers at 2¼d. per lb. for first grade and 1½d. per lb. for second grade. The money required was advanced by the Swaziland Power Co., Bremersdorp, who operate the ginnery.

Prospects for 1944-45.—In view of the rather depressed state of the cotton market in South Africa it has not been possible to encourage cotton planting. Furthermore the planting season proved very unfavourable in the bushveld where the crop is mostly grown. Rains were late and very light and the people were unable to grow all the cereals required and had no thought or labour to spare for cotton planting until the season was too far advanced. As the people know well the unfortunate fate which awaits late crops when the cattle are set free for unrestricted grazing, practically nothing has been planted. In a good season interest in cotton should easily be re-awakened.

337. Cotton Breeding and Variety Trials at Croydon Station, 1943-44. (*Ann. Rpt. Vet. and Agr. Dpt.*, 1944.) A strain similar to that at Aird was planted. The dry conditions of the early part of the season were followed by high rainfall in January and February, and there was some loss by red bollworm. Later conditions were dry and the excellent crop of 13,000 lb. was reaped from the short flowering season.

338. Sudan: Cotton Industry, 1943-44. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1943-44.) After the bumper season of 1942-43 in the Gezira, the Gash and at Tokar, 1943-44 showed a heavy drop, and the total output of Egyptian-type cotton for the country was smaller by nearly 40 per cent. The amount of American-type cotton was about the same, but the crop was again a very small one in comparison with some earlier years, on account of the precedence that it has been necessary to give to food crops in the rainfall areas. It is satisfactory to report that the latest estimates for the current season point to a total crop not far below that of 1942-43.

339. Report of the Agricultural Research Institute, 1938-39. (*Ann. Rpt. of Dpt. of Agr. and For.*, 1939. Pt. II. Received 1945.) Contains, in addition to the note by the Director, reports of the Agricultural, Botany and Plant Pathology,

Chemical, Entomological, Plant Breeding, Plant Introduction, Plant Physiology and Soil Research sections.

From the note by the Director we learn that yields of cotton on the Gezira Research Farm were good, being 5·97 kantars per feddan for X1730A and 4·17 for Sakel. In the Sudan Plantations Syndicate area in general X1730A gave 4·81 kantars per feddan average, X1530A 4.615 and Sakel 4·12. On the Kassala Cotton Company area the yields were 5·40 kantars per feddan, 4·84, and 4·22 respectively. The Abdel Magid scheme gave 4·50 kantars per feddan of Sakel. Cotton on the Farm made a satisfactory start (apart from white ants) and weed growth was not excessive. The cotton observation plot records showed an excellent final yield, being the highest since the experiment started in 1927-28. The experiments in connection with crop rotations, manuring, cultivation, irrigation, and soil improvement were continued. Damage from blackarm and leafcurl was, in general, not so severe. The major pests encountered were pink bollworm, *Earias*, American bollworm, thrips, white fly, jassid, and cotton flea beetle, most injury being caused by the last three pests. In addition serious injury was caused to dura by locusts. In the Plant Breeding section good progress was made in the production of a blackarm-resistant type of Sakel. At Kadugli the breeding of American strains progressed. The propagation plot of NT2 on the Barakat Seed Farm suffered from blackarm and pink bollworm attack which reduced the yield.

340. Work of the Plant Breeding Stations, 1943-44. (*Prog. Rpts. from Exp. Stats.*, 1943-44.) *Cotton: Egyptian Types.* Tests of Blackarm-resistant X1730 (BAR. 1730L) in the Gezira showed it to be typical X1730 in every way, but capable of outyielding the commercial X1730A wherever blackarm was present. Spinning reports from previous seasons showed no difference between X1730A and BAR. 1730L. This strain will, accordingly, go to an increase area in the Gezira next season with a nucleus of ninth backcross material. Blackarm-resistant N.T.2 (BAR.2/41) was grown on 1,000 feddans in the Gash, and seed from this will be used to sow some 6,500 feddans in the Gezira next season. Selection within the Blackarm-resistant strains of X1730 and N.T.2, carrying $\mathbf{B}_2$, was started in 1942-43, and some of the best progeny rows in each type were bulked this season for sowing in nucleus multiplication plots. Other specially selected plants will be sown in next season's breeding plots. The production of X1730 and N.T.2 strains carrying both $\mathbf{B}_2$ and $\mathbf{B}_3$ was carried a stage further and propagation plots of these types will be grown at Shambat next season. The transference of the four genes $\mathbf{B}_1$, $\mathbf{B}_2$, $\mathbf{B}_3$ and $\mathbf{H}$ to Domains Sakel was continued, and second backcross seed was produced for 1944-45 sowing. Selection for leaf curl resistance in Domains Sakel and in Massey's Selected Domains Sakel, is proving progressively effective. The transference of blackarm immunity from *G. sanguineum* to Sakel was taken to the third Sakel backcross stage. Selection for early maturity has been undertaken in Domains Sakel, Blackarm-resistant X1730, and Blackarm-resistant N.T.2. At the same time work designed to improve the staple regularity and quality of these three strains has been started. In breeding for jassid resistance the transference of the Tanguis hairiness gene to Domains Sakel, X1730, and N.T.2 was continued, whilst hairy strains of X1530 origin are being re-selected and tested in the breeding plots and at outstations. A presumed hexaploid (2n=78) of *G. armourianum* × Sakel origin was obtained. This is itself fertile and is fertile in backcrossing to Sakel. It is hoped to transfer the pink bollworm-resistance of *armourianum* to Sakel by backcrossing from the hexaploid.

American Types.—(*a*) *Nuba Mountains.* Here N.T.205/41 (derived from Uganda S.P.20) shows most promise. It is very early, has lint quality almost equal to Pump Scheme, has a higher yield and higher ginning outturn, and is resistant to blackarm and jassid. Deltapine has consistently outyielded Pump Scheme, but lacks quality and is only slightly resistant to blackarm; resistance has been transferred and the product is available for testing. S.P.84 (Rest.), the blackarm-resistant element from Uganda S.P.84, showed considerable promise, but requires more comprehensive testing. The transference of an additional blackarm-resistance factor ($\mathbf{B}_3$) to this type was carried a stage further as was the transference of Tanguis hairiness.

(*b*) *Equatoria Province.* 511D (from Uganda S.G. 85) is the commercial type on the west bank. It is already blackarm resistant (B_2) but B_3 is being added to increase this resistance. X.A.129 was the commercial type on the east bank until production ceased owing to war. It was susceptible to blackarm, but has now had B_2 transferred to it, and an attempt is being made to transfer some of the high ginning outturn of Deltapine to this type by backcrossing. S.P.84 (Rest.) showed most promise in both eastern and western Equatoria, but was fairly closely followed by N.T.205/41. The transference of blackarm-resistance to Uganda B.P.52 was carried two backcrosses further.

341. Tanganyika Territory: Cotton Industry, 1942-43. (*Ann. Rpt. Dpt. Agr.*, 1943. Received 1945.) There was a heavy decline in cotton production consequent upon very unfavourable planting conditions coupled with the diversion of man power to the production of food crops and other urgent war priorities. In the Lake Province growing conditions in the latter half of the season were favourable and yields were fair in most areas. The major cotton pests were less destructive than usual in the Lake Province, but the nature and effects of the pest complex in the Eastern Province became a matter for very close study.

Research Work in the Territory.—The work of the Department's experiment stations at Ukiriguru, Lubaga, Nyamahona, Tumbi, Mwanhala and Morogoro was continued. The cotton work at Kingolwira has been almost entirely transferred to a more suitable site at Ilonga, Kilosa, where it is hoped to establish a full-scale station in the near future. The central stations in the Lake and Eastern Provinces were supplemented by a number of small satellite experiment plots scattered over the area served by each station. The investigations were mainly concerned with fertility problems, the improvement of cotton strains, and native food crops including rice. Great appreciation is expressed of the continued help afforded by the Empire Cotton Growing Corporation in loaning four of its officers, under whose supervision the main part of the work was carried out.

342. Cotton Industry, 1943-44. (*Ann Rpt. Emp. Cott. Grwg. Corpn.*, 1943-44.) In the Lake Province, where most of the cotton crop is grown, there was a drastic reduction in acreage in 1943-44. Following on the previous very dry season, there was a fear of food shortage, though, actually, as a result of good April rains, the millet harvest was good. The small area planted to cotton in the middle and south of the Province was sown late, and gave poor yields, but around the Lake the harvest was good. In the Eastern Province the rainfall for the season 1943-44 was very unevenly distributed, and the planting of all crops was late. A campaign was carried out to increase food production, and this naturally led to a further reduction in cotton acreage. There was a partial failure of the short rains followed by a drought which necessitated much replanting of all food crops when the long rains started in March, and much of the cotton was planted very late. Insect pest attack on cotton was very heavy, and the crop was the lowest for many years.

343. Cotton Selection Work, 1943-44. (*Prog. Rpts. from Exp. Stats.*, 1943-44.) Cotton selection work towards the production of a better strain continues favourably. This is, after jassid resistance, the second requirement in the creation of a more stable cotton industry. A range of the best selections from Lubaga and Ukiriguru is now being tested, preparatory to the future centring of the work at Ukiriguru. It appears probable that in the present selected material there is a strain to replace Mz.561, combining good jassid-resistance, yield, vigour, a reasonable ginning percentage, and lint quality. It is a matter of getting the best combination of the characters desired; the assessment awaits trial results and lint reports. It seems most likely that the next big advance will be from locally-selected strains from hybrid material from Barberton.

In the Eastern Province the early and prolific types under test have given better yields than Eastern Province Local. In this respect MU8A is again outstanding. Unfortunately Uganda BP.52, the only type in the variety trials definitely better than Local for lint quality and ginning percentage, gave disappointing yields.

344. Proceedings of a Departmental Conference held at Lyamungu, 8th to

13TH JANUARY, 1945. Records the recommendations of the Conference in connection with the following: Soil conservation; Co-operative Societies and their Relations with the Dept. of Agriculture; Establishment of Co-operative Societies; Agricultural Policy for Africans; Vermin Control; Mechanical Cultivation and Collective Farming for Natives; General Experimental Work and its Co-ordination; Improvement of Food Crops; Crop Reports and Returns; Agricultural Literature for Africans; Training of Agricultural Instructors; Agricultural Education; Post-War Non-African Settlement; Agricultural Policy for Sleeping Sickness Settlements; Relationship between Animal Husbandry and Agriculture, etc.

345. COTTONSEED OIL MILL. (*Crown Col.*, September, 1945, p. 651.) The first cottonseed oil mill has been opened in Dar-es-Salaam. The mill aims at handling some 4,000 to 5,000 tons of cottonseed a year, producing a refined oil suitable for cooking purposes. Later it is hoped to produce vegetable ghee and margarine in considerable quantities.

346. UGANDA: COTTON INDUSTRY, 1943-44. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1943-44.) Unfavourable weather was experienced throughout the season. Plantings were good, but the autumn rains failed, and cotton planted after mid-July gave only very low yields. The acreage showed a considerable increase over the previous season, and production amounted to over 191,000 bales, but this was considerably less than was expected at the beginning of the season.

1944-45 *season*. There was serious food shortage throughout the Protectorate, and a maximum food crop acreage was the prime interest of the cultivators. These facts naturally affected the area planted to cotton. The final acreage, however, was not much reduced, and a crop at least equal to, and probably exceeding, that of the previous season was anticipated.

347. COTTON PROSPECTS, 1945-46. The report received from the Dept. of Agriculture for the month of June stated that, with a few exceptions, more rain was received than is normally the case for June. The acreage planted to the end of the month, although considerably below normal, was satisfactory, considering the delay in food crop planting, and the young crop was making good progress. Heavy withdrawals of seed continued, the preparation of plots for sowing proceeded, and, provided the rains continued, there was every indication that an acreage approaching normal would be planted.

348. COMPOST FACTORY. (*Trop. Agr.*, July, 1945, p. 140.) A compost factory has been set up to produce initially 5,000 tons per annum from Kampala township wastes. The output is reserved for application to African farms within a radius of five miles, and is intended to provide a suitable manure for regenerating the soil in overcrowded areas adjoining the town.

349. AUSTRALASIA. QUEENSLAND: WORK AT THE COTTON RESEARCH STATION, BILOELA, 1943-44. By W. G. Wells. (*Prog. Rpts. from Exp. Stats.* 1943-44.) Field observations on both Miller and New Mexico Acala cottons indicated that a greater uniformity of plant characters coupled with a slight improvement in general fibre quality had been obtained in an increase of a mass-selected stock. Promising results were also obtained with progenies of the leading commercial strain of Miller. An increase in the fibre length and lint percentage is desirable, but difficulty has been experienced in past seasons in improving either character. Significant correlation coefficients of the order of ·65 were obtained for the two characters between open pollinated 1943 parents and 1944 progeny rows, although no other correlations in this variety and none in New Mexico Acala were obtained. The jassid-resistant breeding programme was handicapped by the almost complete absence of jassids on the experimental plots. A strain trial of advanced hybrid strains, jassid-resistant Miller strains, and commercial stocks of Miller and of New Mexico Acala, yielded results which indicated that in many characters the jassid-resistant material was as uniform as the commercial stocks. Apparently rigid selection for large-bolled types, together with the use of large-bolled strains as the recurrent parents, resulted in the elimination of the small U.4 boll type. On the other hand, the flowering rate of the hybrids was much closer to the prolific U.4. Marked differences in shedding of the flowers

occurred, however, some strains which produced large numbers of flowers yielding less than others producing appreciably fewer flowers. In a strain trial the highly jassid-resistant Miller strain III-26 showed good yielding qualities, but improvement in boll size and lint length is still required. Due to the light jassid attack many hybrid selections were immune, and had to be retained for further testing. The Rhodesian strains, a strain of Ferguson, and the F_1's of these and commercial varieties all showed complete immunity, but the commercial parents of the F_1's exhibited slight to moderate reactions. An interesting feature of the jassid problem was the severe jassid attack on late plantings of irrigated cotton. To obtain sufficient jassid infestation to test the resistance of the new hybrid material, a late-planted irrigated area will be included in the coming season's programme. During the season under review cotton was also attacked by *Heliothis*, and investigations were carried out on the effect of planting dates on the incidence of the pest; the control obtained with insecticides on crops planted on soils of different ages; and a straight comparison of 1-1-3 and 1-1-6 lead arsenate-molasses sprays applied with a Barbour mechanical spraying machine during bursts of *Heliothis* activity.

350. Queensland: Cotton Varieties Recommended for the 1945-46 Season. By R. W. Peters. (*Queensland Agr. J.*, June, 1945, p. 339.) The following varieties are listed, together with the cotton-growing areas for which they are considered as most suitable: Miller, and its derivatives; New Mexico Acala; Triumph, and its derivatives; Lone Star; Qualla.

351. Growing Cotton with Supplementary Irrigation. By W. A. R. Cowdry and N. H. Adams. (*Queensland Agr. J.*, December, 1944, p. 328.) Gives the results of investigations in connection with irrigation varietal trials, methods of application of irrigation water, and times of application, conducted at the Biloela Research Station during the seasons 1940-41 to 1943-44 inclusive.

352. The Significance of Carbon-Nitrogen Ratio in Soils Growing Cotton. I. The Cotton Soils of Queensland, Australia. By F. Hardy. (*Trop. Agr.*, July, 1945, p. 119.) This article presents results of laboratory analysis of representative samples examined both in Queensland and at the College in Trinidad of some typical Queensland soils supporting cotton plants prone to "bolting"— that is, to the development of unfruitful, rank, sappy growths particularly susceptible to insect attack. It was found that the soils producing bolting plants are characterised by relatively low carbon-nitrogen ratios, whereas those supporting normal fruitful plants show high carbon-nitrogen ratios over a wide range of organic matter contents. The critical C/N ratio value seems to lie between 7·0 and 8·5. Satisfactory, high-ratio cotton soils in Queensland are mostly rich alluvial soils, and unsatisfactory low-ratio soils are Red Earth soils. Black Earth soils are intermediate. These three soil groups comprise most of the Queensland cotton lands, both actual and potential. Bolting of cotton has been shown to be a physiological phenomenon associated with high rates of nitrate production in the soil which is a feature of low C/N ratio soils under certain moisture conditions. (On incubation in the laboratory, low-ratio cotton soils associated with bolting give values for nitrate-nitrogen up to 60 p.p.m., whereas high-ratio, normal soils seldom give values more than 30 p.p.m.) A striking feature of cotton soils in Queensland is the "new land" or "new cultivation" effect which is manifest in the early cotton crops not showing bolting and giving satisfactory yields, whereas the later crops show the phenomenon increasingly during successive croppings. The cause of this effect has also been traced to high C/N ratio in soil newly brought in from forest or bush, and this is again associated with a low rate of nitrate production. Furthermore, land that has been in grass for several years following many successive crops of cotton which have given diminishing yields through bolting, is capable of supporting satisfactory crops without bolting when again brought into cultivation, for the same reason.

The chief factors deciding the suitability of the soil and the site for successful cotton cultivation in Queensland are then discussed.

353. West Indies: The West India Committee: Report of the Executive Committee for 1944-45. (*W. Ind. Comm. Circ.*, May, 1945, p. 79.) The Advisory

Committee in England of the West Indian Sea Island Cotton Association, on which the West India Committee is represented, has been occupied by questions affecting the future of the Sea Island Cotton industry. Meetings have been attended by Mr. A. J. Wakefield, C.M.G., Inspector-General of Agriculture for the West Indies, and Mr. J. B. Hutchinson, C.M.G., formerly Cotton Adviser at the Imperial College of Tropical Agriculture, Trinidad. Two of the main problems of Sea Island cotton growing (i) Plant breeding and seed control, and (ii) Control of pests and diseases, have been dealt with in the West Indies and put on a sound basis. The problem of very low average yield remains. Increased yields are essential to meet Egyptian competition, and sufficient work has been done to show that the correct use of manures and improved methods of cultivation would substantially increase yields. Development of this work is vital to the industry. The 1943-44 crop of 3,703 bales of Sea Island cotton shows a slight reduction in comparison with the previous season. The entire crop of clean lint was again purchased by the Ministry of Supply. The crop of Marie Galante cotton amounted to 396 bales.

354. BARBADOS: COTTON INDUSTRY, 1943-44. (*Ann. Rpt. of Dpt. of Sci. and Agr.*, 1943-44, received 1945.) The acreage planted to cotton was 905 acres as against 648 in the previous season. The yield of seed cotton amounted to 227,188 lb., of which 182,745 lb. was peasants' cotton. The average yield per acre was 251 lb. Ginning percentage, as recorded by the Barbados Co-operative Cotton Factory, was 27·1. The cotton leafworm (*Alabama argillacea*) caused severe damage to cotton in some areas; this was mainly due to the scarcity of spray apparatus and material. For the fifth year in succession no pink bollworm was found in the cotton crop.

Cotton selection work.—Selfed seed of the bulked cotton from 13 selections of the 1942-43 progeny plots was grown at Codrington Experiment Station in a variety trial with B.1 as a standard. Seven of these have been selected on yield of seed cotton per acre and ginning outturn, and will be grown in a further variety trial next season; they are B.4203, B4204, B4205, B4206, B4209, B4211 and B4212. A second variety trial was conducted at Codrington during the season, which included selections of the B38, B40 and B41 series with the standard B.1, and two strains selected in St. Vincent by the Cotton Station from seed of a Barbados strain sent there for progeny work; these have been numbered B(41)5 and B(41)9. Three of the varieties in the trial have been retained, viz. B4106, B4111 and B(41)9, and will be included in a variety trial next season with the selection of the B42 series and the standard B.1. Samples of lint of the 13 strains B4201 to B4213 and of the varieties B4101, B4103, B4105, B4106, B4107, B4111, B(41)5 and B(41)9 and B.1 were sent to the Shirley Institute for small scale spinning tests.

355. COTTON SPINNING IN THE WEST INDIES. (*W. Ind. Comm. Circ.*, August, 1945, p. 154.) A grant, under the Colonial Development and Welfare Act, has been approved for the establishment of a plant where experiments can be made into the commercial possibilities of cotton spinning as a secondary industry in the West Indies. The plant will be situated in Barbados and, as the Governor informed the House of Assembly, the Secretary of State has suggested that the Barbados Government should take over the control and administration of the scheme.

356. ST. VINCENT: COTTON EXPERIMENT STATION, 1941-43. By H. L. Manning. (*Ann. Rpts. of Dpt. Agr. St. Vincent*, 1942, 1943. Received 1945.) *Season* 1941-42. Maintenance of the Superfine V.135 cotton was carried out during the season. The introduction of the Balanced Incomplete Block technique made possible the statistical examination of larger numbers of progeny of the promising St. Vincent × Montserrat hybrid material known as VH. A fertilizer trial, with varietal comparisons included, provided some evidence in regard to the greater effectiveness of nitrogen in nitrate of soda relative to compost. In this experiment Barbados Sea Island significantly outyielded the V.135 Superfine.

Season 1942-43.—As a result of proven heterogeneity of variance between some Sea Island varieties for the attribute lint per seed, only Superfine varieties were included in the randomized complete block progeny row trial, which provided pedigree

planting seed. Yield differences between V.135 strains were small, and as a result this seed will now be placed on a maintenance basis in non-replicated progeny rows. The successful introduction of the Balanced Incomplete Block form of statistical analysis for the VH Breeding Trial, has made it possible to examine a very large number of progenies with relatively high precision. The gain in efficiency, for yield comparisons, was 152 per cent. compared to the equivalent Randomized Complete Block design. The adjusted data provided by this trial gave a more accurate estimate of the multiple regression form of yield analysis. The independent regressions of the fundamental attributes, bolls per plant, seeds per boll and lint per seed, on yield, were, as a result, of relatively high precision. This technique is of value in directing the most likely selection advance for yield in these hybrids. A $3 \times 2 \times 2 \times 2$ fertilizer trial was laid down on eroded land. As expected, nitrogen provided the greatest single stimulus to growth and yield. Potash was effective mainly in reducing shedding of bolls rather than by increasing potential bolls per plant. Phosphate effect was of low magnitude and was confined to the growth period immediately following budding. A comparison of compost and equivalent NPK was included and it was shown that yield increment of the latter was significantly higher.

357. Arrowroot and Cotton. (*W. Ind. Comm. Circ.*, April, 1945, p. 71.) The Administrator has appointed a committee to consider the decline in the output of arrowroot and cotton, and to report as to what measures should be taken to increase production in these two of the Colony's main industries.

358. Memoirs of the Cotton Research Station, Trinidad. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d. post free.) The twenty-fifth number of Series A. Genetics has recently been published and contains the following paper, reprinted from the *Empire Journal of Experimental Agriculture.*

The Sea Island Cottons. By J. B. Hutchinson and H. L. Manning. Sea Island cottons form a well-defined agricultural race of the species *Gossypium barbadense*. They consist exclusively of cultivated annual cottons, and their distribution is so limited that it has been possible to collect at the St. Vincent Station practically all the types now in existence. Data on the history and relationships of this collection have been accumulated as a guide to breeding work, and an account of the varietal status of the group is here presented.

The first introduction of the *G. barbadense* cottons into the south-eastern United States is generally accepted to be about 1785, and the cottons appear to have established a reputation for high quality immediately. The history during the nineteenth century is obscure. By the end of the century, however, the finest portion of the crop was grown on the Sea Islands off the coast of South Carolina, and the name " Sea Island " was given to all of the *G. barbadense* crop, both mainland and island. Sea Island cotton was first introduced into the West Indies at the beginning of the twentieth century to provide an alternative crop to alleviate the distress amongst sugar-cane producers. The credit for the successful establishment of the new industry, the prevention of varietal deterioration and its protection from pests and diseases is due to the Imperial Dept. of Agriculture, and in particular to the first Commissioner, Sir Daniel Morris. An account is given of the selection work with Sea Island cotton from 1903 to the present time. The West Indian strains may be divided into three varieties, which can be distinguished by their habit, boll-size, percentage of bolls having 4-loculi, ginning outturn, and quality. They are Rivers, Superfine V46, and MS1, and detailed descriptions are given in the paper.

COTTON IN THE UNITED STATES.

359. American Cotton Acreage, 1945. (*Fibres*, September, 1945, p. 105.) The estimated acreage of cotton on July 1 was 18,355,000 acres, which is 2,000,000 acres or 9·8 per cent. less than last year, and 30 per cent. less than the 10-year (1934-43) average. The total acreage planted to American-Egyptian cotton is estimated at 6,400 acres, compared with 14,700 acres planted last year, and 75,300 acres, the 10-

year average. The sharp reduction in cotton acreage is partly attributed to unfavourable planting weather, but also reflects difficulties in securing labour. Considerable difficulties were experienced in harvesting the 1944 crop.

360. AMERICAN COTTON INDUSTRY, 1945. (*Ann. Outlook Number*, 1945. *Curr. Farm. Econ.*, **17**, 6. Oklahoma, 1944.) Cotton farmers are assured 92½ per cent. of parity for the 1945 cotton crop under existing legislation. Since parity is expected to decline very little by the summer of 1945, cotton is in a good competitive position as far as prices are concerned. Labour is the limiting factor in cotton production. There are few indications that labour will be more plentiful for preparing land or for chopping. Increased labour may be available in the fall of 1945, arising from reduced industrial employment and reductions in the armed forces, but the amount may be very small. War prisoners are being used in considerable numbers for cotton harvesting in some sections. Production machinery may possibly be slightly more plentiful in 1945 and more repair parts will be made. Cotton harvesting machines are not likely to be available in sufficient numbers to meet the demand.

361. AGRICULTURAL STATISTICS, 1944. U.S. Dept. of Agr. (For sale by the Supt. of Documents, U.S. Govt. Printing Office, Washington, 25, D.C.) This is the ninth issue of this publication prepared under the direction of the Yearbook Statistical Committee. It includes statistics of grains, cotton, sugar, tobacco, oilseeds, fats, oils, fruits, vegetables, melons, tree nuts; hay, seeds, and minor field crops; beef cattle, hogs, sheep, horses, mules; dairy and poultry products; farm capital and income statistics; agricultural conservation and adjustment statistics; miscellaneous statistics. A table of weights, measures, and conversion factors used in the Dept. of Agriculture is also included, and the volume is furnished with a useful index.

362. CROP IMPROVEMENT. By M. A. McCall. (*Ind. Frmg.*, January, 1945, p. 40.) In the Southern States of America an integral part of the crop improvement programme is the single cotton variety community project. In 1942 there were 2,563 one-variety communities operating in 575 counties in 17 cotton-producing states, and involving 7,613,533 acres and a production of 4,750,122 bales. This was 35 per cent. of the total cotton crop, and a considerably higher proportion of that part of the crop most needed to supply standard materials for the Army and Navy. Research has demonstrated that yarns from the varieties chosen for growing in the one-variety communities are from 15-20 per cent. stronger than those produced from most of the other widely grown varieties of equal length. Among other urgent needs of the armed forces have been adequate supplies of long staple cottons of superior strength for special uses. The American-Egyptian variety, S×P, has been demonstrated to possess the necessary value to meet special requirements for balloon cloth, life preservers and rafts, machine gun webbings, and many other uses for which strength and wearing quality are necessary. A new variety, Amsak, just coming into production is equal or superior to the best Egyptian varieties formerly standard for such specialities. Farmers have been able to meet these needs only because of these superior varieties and their adaptability.

363. CHANGES IN COTTON PRODUCTION IN WAR AND PEACE. By E. L. Langsford. (*U.S. Dpt. Agr., Bull. Agr. Econ., F.M.* 45, 1944. From *Exp. Sta. Rec.*, **92**, 5, 1945, p. 718.) The trends in acreages and yields in the United States, 1919-44, the reduction of yields due to specific causes 1910-43, and the use of commercial fertilizers 1928-44, are described, and the changes 1928-43 in the different production areas, together with the post-war implications of recent and impending changes, are discussed.

364. RESPONSE TO PRICE IN PRODUCTION OF COTTON AND COTTONSEED IN AMERICA. By R. M. Walsh. (*J. Farm. Econ.*, **26**, 2, 1944, p. 359. From *Exp. Sta. Rec.*, **92**, 1, 1945, p. 128.) During the period studied, 1910-33, the acreage response to the price of cotton adjusted for changes in prices paid by farmers for all commodities was on two distinct planes, the regression equation being $X_1 = 25{\cdot}568 + 0{\cdot}683X_2$ for 1910-24 and $X'_1 = 33{\cdot}238 + 0{\cdot}888X'_2$ for 1925-33. The elasticity of response was approximately the same in both periods. The elasticity of supply for acreage varied from 0·1 to 0·3 at different levels of price. The first-difference analysis for 1911-33 showed that

a 1-ct. change in price was followed by a change of approximately 880,000 acres. During periods of acreage control by the A.A.A. normal acreage-price relationships failed to hold. Changes in southern agriculture, such as further development of oil-bearing crops, feed crops, and livestock, and possibly tobacco, may alter previous relationships.

365. AMERICAN FUNDAMENTAL TEXTILE RESEARCH PROGRAMME. By H. Eyring. (*Text. Res.*, 14, 1944, p. 396. From *Summ. Curr. Lit.*, xxv., **8**, 1945, p. 202.) In this account of the fundamental research programme of the U.S. Textile Foundation and Textile Research Institute the author indicates the complexity of the problems to be studied, and discusses briefly the work being carried out on the deformation of fibres and the relaxation of stress at constant strain of natural cellulosic fibres, and plans for the study of the effect of chemical treatment on natural and artificial fibres, the mechanism of dyeing, the constitution of dyes, polymer length distribution in artificial fibres, and the methods and mechanisms of water-, fire-, and rot-proofing.

366. AMERICAN COTTON: FIBRE CHARACTERS AND SPINNING QUALITY. By T. S. Harris. See Abs. 516.

367. SAW-GINNED AND ROLLER-GINNED LONG-STAPLE AMERICAN UPLAND COTTON: SPINNING QUALITY. By S. Williams and J. Towery. See Abs. 428.

368. FLORIDA: SEA ISLAND COTTON. By W. E. Stokes *et al.* (*Ann. Rpt. Agr. Exp. Sta., Florida*, 1942-43.) "Strain tests are in progress in the Leesburg, McIntosh and Gainesville areas. Twelve B-2, Z-10, TZ, and TZRV, representing selections out of Seabrook, and several Sea Island Upland hybrid cottons, are included in the tests. Fertilizer work is being carried out to determine the major and minor element requirements of Sea Island cotton with particular emphasis on nitrogen, phosphorus, potassium, calcium, copper, zinc, manganese, boron, and magnesium. Thus far this cotton has shown good response to a complete fertilizer, no particular response to lime, and in some instances response to minor elements. On old plantation lands, Ruston soil, of Madison County, rather outstanding response to potash is noted."

369. COTTON VARIETY TEST. By J. D. Warner. (*Ann. Rpt., Agr. Exp. Sta., Florida*, 1941-42.) Twelve varieties commonly grown in north-western Florida were entered in the test. Coker's 100 Wilt 39-5, Cook's Stoneville and Stoneville 2B made the highest yields of seed cotton. Pounds of seed cotton per acre ranged from 766 for Rhyne's Cook to 1,180 for Coker's 100-Wilt 39-5. Nine applications of calcium arsenate dust gave only partial control of the boll weevil. This was due to frequent rains during July favouring boll weevil infestation, and rendering conditions unfavourable for its control by dusting with calcium arsenate.

370. CROP ROTATION STUDIES, 1940-41. By W. E. Stokes *et al.* (*Ann. Rpt., Agr. Exp. Sta. Fa.*, 1941.) The average yield of seed cotton for 1940 on all plots which had been rotated with corn was 586 lb. per acre compared with 350 lb. per acre on those plots which had grown cotton continuously.

371. GEORGIA: COTTON VARIETIES FOR SOUTH GEORGIA FARMS. (*Mimeo. Pap. Ga. Coastal Plain Exp. Sta.*, **34**, 1945, p. 1. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 254.) The yields of the six highest yielding varieties in five years' tests are given. Deltapine 14, Marett's White Gold, Stoneville 2B, and Rhyne's Stoneville have produced good yields on land not highly infested with wilt. Tifton Station 21 and Coker's 4-in-1 are more wilt resistant than these varieties. Two new varieties, Wannamaker's Stonewilt and Coker's 100 W.R., are mentioned as promising wilt resistant varieties.

372. COTTON EXPERIMENTS. (*56th Ann. Rpt. Ga. Exp. Sta.*, 1944. From *Exp. Sta. Rec.*, **93**, 2, 1945, p. 233.) The work on cotton included tests of Empire cotton for yield, thrips injury, and wilt resistance; cotton variety tests; cotton seed disinfection; fertilizers for cotton following *Lespedeza sericea*; boll weevil control measures; use of DDT as an insecticide.

373. COTTON EXPERIMENTS. By G. H. King. (*Bull. Ga. Coastal Plain Exp. Sta.*, **40**, 1944. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 209.) Crosses have been made between Tifton Station 21, a high yielding wilt-resistant variety, and a number of early types. Several lines have been obtained which evidently combine the yield and quality of Tifton Station 21 with the earliness of the other parent. In an attempt

to increase the staple length of Gaddis, a number of crosses have been made between this variety and other Sea Island strains and hybrid lines. Several hybrids have shown promise in the F_2 generation. No correlation was found between either boll-weevil damage or yield and so-called earliness or lateness of fruiting.

374. Mississippi. Cotton Varieties in the Hill Section of Mississippi, 1944. By J. F. O'Kelly. (*Miss. Sta. Bull.* 411, 1944. From *Exp. Sta. Rec.*, **93,** 2, 1945, p. 144.) Lint yields per acre, acre value, lint percentage, and staple length are reported for cotton varieties tested at four locations in 1944 and during the period 1940-44. Leaders in average acre lint production in 1944 included Deltapine-14, 622 lb., Delfos-9169, 617; Cleveland-54, 616; Miller, 610; Hi-Bred, 609; Coker 100W-3, 605, and Empire, 590 lb. per acre.

375. A Year of Research in Mississippi Farm Problems. Cotton Investigation: Breeding, Genetics, Varieties. By C. Dorman. (*Miss. Fm. Res.*, **5,** 10, 1942, p. 3. From *Pl. Bre. Abs.*, xv., 2, 1945, p. 149.) Studies at Stoneville Station have demonstrated that the efficiency of selection within many varieties of cotton can be increased by preceding the selection by three to five years of inbreeding.

376. The Current Cotton Research Programme in Production and Related Fields, January, 1945. By F. J. Welch. (*Miss. Sta.*, 1945, p. 103. From *Exp. Sta. Rec.*, **93,** 1, 1945, p. 35.) Included are statements of the titles and objectives of the current active projects of Federal, State, and private funds, classified as follows: (1) breeding, genetics, and improvement of varieties; (2) cotton variety testing work and geographic distribution of varieties; (3) the genetic, technical, and economic aspects of cottonseed production; (4) soil fertility and the use of fertilizer in cotton production; (5) cotton disease control and seed treatment for better germination of improved varieties; (6) cotton insect and pest control; (7) cultural methods and mechanical operations; (8) general farm management problems and practices, and marketing and distribution problems; (9) ginning and other preparations for the market; (10) cotton fibre analysis in relation to cotton utility as a basis for breeding and production, for improvement of ginning, for better and extended utilization, and for standardization and classification; (11) foreign competition and demand; (12) domestic price policies and programmes.

377. Economic and Cost Study of Cotton Ginning in Central Mississippi. By D. G. Miley and A. L. Roberts. (*Miss Sta. Bull.* 403, 1944, p. 29. From *Exp. Sta. Rec.*, **92,** 3, 1945, p. 425.) This study of the influence of ginning machinery and equipment on the costs of ginning and quality of cotton is based chiefly on data for 10 modern, 15 average (equipped to do fair ginning), and 18 substandard gins in an area in four counties. Most of the gins were in one-variety-cotton communities, and the cotton was classified by the Department. The general characteristics of the gins and transportation to gins are described. Analysis is made of the different current expenses, salaries of managers, investment costs, fees for ginning, profits on gin operation, net receipts from cottonseed and bagging and ties, and net income from labour and to the gins, total and per bale for the three types of gins. The influence of size of gins, volume ginned, use of labour and capital, and power costs on ginning income, and the factors affecting cotton quality are discussed.

378. The Effect of Nitrogen upon the Response of Cotton and Oats to Phosphorus. By R. Coleman. (*J. Amer. Soc. Agron.*, **36,** 12, 1944, p. 970. From *Exp. Sta. Rec.*, **93,** 2, 1945, p. 126.) Greenhouse or field experiments were conducted with cotton and oats on Paden and Grenada silt loams and Ruston and Atwood sandy loams to determine the effect of nitrogen level of the soil on crop response. There was a definite relationship between the amount of nitrogen available to cotton and oats and their response to phosphorus. Cotton and oats gave only a slight response to phosphorus applied with small amounts of nitrogen, but both crops gave a high response to phosphorus applied with large amounts of nitrogen. Plants receiving adequate amounts of nitrogen not only respond better to phosphorus but they also require larger amounts of it.

379. Lime and 0-8-6 Produce Vetch Nitrogen for Corn and Cotton in Brown Loam Soil Areas. By H. B. Vanderford. (*Miss. Farm Res.*, **7,** 12, 1944, p. 8.

From *Exp. Sta. Rec.*, **92**, 5, 1945, p. 623.) Grenada silt loam, a Brown loam soil, was used in greenhouse, laboratory, and field studies to determine the most desirable lime level for legume growth. Using soybeans, Korean lespedeza, and sweet clover, it was found that *p*H 7 was the most desirable level.

380. INFLUENCE OF CERTAIN SOIL AMENDMENTS ON THE YIELD OF COTTON AFFECTED BY THE *Fusarium-Heterodera* COMPLEX. By J. A. Pinckard and O. A. Leonard. See Abs. 423.

381. COTTON YARN STRENGTH AFFECTED BY HARVESTING PRACTICES. (*Cotton*, M/c., 16/6/45.) Mr. F. L. Gerdes, Senior Cotton Technologist, U.S. Cotton Ginning Laboratory, Stoneville, Mississippi, states that good spinning results are dependent on qualities produced and ginned under not too widely varying conditions. He points out that cotton drying at gins has proved to be effective in bringing about improvements in grade, and increases in ginning capacity, with green, damp, or wet cotton. Studies of actual operating conditions have revealed increases in average bale value ranging from about $1 to $5 per bale, as a result of drying. From the standpoint of preserving spinning quality of cotton, the artificial drying process employed properly has been found to be more dependable than sun-drying under most farm conditions. Tests have shown that the grade improvements with gin drying were reflected in decreased picker and card waste, while there were generally no beneficial effects of this kind shown for sun-drying. Moreover, sun-drying caused reduction in yarn strength ranging from 4 per cent. on 22s yarn for cotton sun-dried for 6 hours to 10 per cent on 60s. yarn for cotton sun-dried for 48 hours. The reduction on artificially dried cotton ranged, on the average, from only about 1 per cent. or a negligible amount, to 1 per cent. for moderate and high-drying air temperatures, respectively.

382. OKLAHOMA: SCIENCE SERVING AGRICULTURE. PT. I. By W. L. Blizzard and L. E. Hawkins. (*Bienn. Rpt. Okla. Agr. Exp. Sta.*, 1942-44. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 210.) New strains are described. Stoneville 62 ranked as second in yield in extension tests in 1943. Oklahoma 92 is an improved strain of Oklahoma Triumph 44; it is extremely early. Oklahoma Special, selected from Acala 5, has a higher yield and is more uniform than Acala 5. Acala 892 is a strain reselected from Acala 5; it has a medium to large boll, and is medium to early maturing. Acala 2496 is a selection from New Mexico Acala 1757, and produces a medium boll with a fine staple. Other improved strains show promise of good yield and better lint quality.

383. AMERICAN COTTON: MECHANICAL HARVESTING. (*Cotton*, M/c., 28/4/45.) Reports recently received from the United States are to the effect that a mechanical cotton harvester has been developed, well adapted to stripping the close-fruited cotton grown in Oklahoma, and the first of its type to be used in the State. At a recent demonstration near Anadarko successful results were obtained, the harvester turning out a lint cotton sample above the average for machine-picked cotton. Equipped with a burr extractor, which not only clears the cotton but drops the burrs over the field, the machine can be adjusted to fit on nearly all types of tractors. It has a capacity for picking from 5 to 10 bales a day. Mechanism of the machine seems to have anticipated perfectly the special needs of the Oklahoma cotton plant. It should be of great benefit to communities conducting variety tests, in that all types of cotton may be picked with uniformity, thus making it possible to secure a comparable grading of the cotton from the different varieties. It is planned to build these harvesters for use in the 1945-46 harvesting season in Oklahoma.

384. NORTH CAROLINA: RESEARCH AND FARMING, 1943. By I. O. Schaub and L. D. Baver. (*66th Ann. Rpt., Agr. Expt. Sta., N.C.*, 1943.) *Cotton.*—Improved inbred strains showed differences of 15 per cent. in fibre diameter, while intervarietal differences for this property amounted to approximately 20 per cent. Inbred lines isolated from Stoneville 4B, Stoneville 2B, and Mexican varieties gave good fibre quality, but the majority of these lines were not as productive as Coker 100 and Deltapine. Segregation and recombinations of fibre characters were observed in progenies of hybrids. Two sister lines showed wide differences in fibre strength and

X-ray angle. A selection from a four-way cross had a finer Hertel fibre index than either of its parents. Among breeding stocks from other states included in the yield tests, the most outstanding was Stoneville 62-1-10 from the Oklahoma Experiment Station. Many new strains of Coker 100 and Coker 100 Wilt were included in tests for adaptability. In studies on the inheritance of fibre strength the data obtained appeared to indicate that high strength is inherited independently of yield and of staple length and is correlated with the arrangement of the cellulose, a correlation which may be determined by the X-ray diffraction pattern. Further evidence showed that high strength may also be correlated with narrow diameter.

385. Cotton Fibre: Strains grown Influence Quality. By J. H. Moore. (*Res. and Frmg.*, **3**, 3, Raleigh, N. Carolina, 1945.) The results of experiments commenced in 1934 indicate the following differences in fibre diameter and staple length within and between varieties of cotton as a result of inbreeding: Acala 4067-31-3-3-1 has a somewhat shorter staple length than Acala 4067-36 (the difference being only $\frac{1}{64}$ inch), but as measured by fibre diameter the former strain is approximately 20 per cent. finer than the latter. The other four varieties, Rowden 40, Rowden 2088, Farm Relief 1, and Coker-Cleveland 884-4, each show differences in staple length and diameter, although the diameter differences are not as great as in the Acala 4067 variety. A comparison of fibre diameter between extremes of varieties shows that the finest Acala 4067 strain is 24 per cent. finer than the coarsest Rowden 2088 strain.

386. Texas: New Varieties of Cotton. By D. T. Killough *et al.* (*55th and 56th Ann. Rpts.*, 1942 and 1943. Received 1945.) New varieties of cotton with good spinning performance have been developed for different parts of Texas. At Denton Station Suntex and Dentex have been developed by inbreeding and selection from Sunshine Rowden, and are being released for commercial production. These varieties produce high yields and are storm proof. The Chillicothe Station has developed Lockett 140 (Mebane 140) and Western Prolific (Mebane 141), which give high yields of medium length staple. The Lubbock Station has evolved a new variety called Stormproof, which gives high yields of cotton with good cleaning and spinning properties, and is essentially adapted to machine harvesting. At the Beeville Station Mebane 804-50, a high-yielding cotton with a medium staple length, has been developed.

387. Effect of Nitrogen and Phosphorus on the Yield and Root Rot Responses of Early and Late Varieties of Cotton (in Texas). By L. M. Blank. See Abs. 420.

388. Hubam Clover greatly Reduces the Early Attack of Root Rot in the Blacklands and Increases the Yield of Cotton. By H. O. Hill and P. B. Dunkle. (*55th* and *56th Ann. Rpts.*, 1942 and 1943.) At the Temple and Denton Substations Hubam clover, when followed by cotton the succeeding year, has given marked increases in acre yield of cotton particularly by delaying the attack of root rot. Hubam clover can also be used for hay and seed, which command a good price.

389. Farm Machine Situation in Texas. By H. P. Smith. (*Farm Impl. News*, **65**, 7, 1944, p. 20. From *Exp. Sta. Rec.*, **91**, 5, 1944, p. 601.) Allocations for materials for a substantial number of cotton harvesting machines of both the stripper and picker types have been requested. Trials have indicated that under some conditions a two-row tractor-mounted " Morco " cotton stripper could be so used that the saving in labour cost alone would be sufficient to pay for a $1,000 machine in 3 or 4 days.

390. Information Basic to Farm Adjustments in the High Plains Cotton Area of Texas. By A. C. Magee *et al.* (*Bull. No.* 652, Texas Agr. Exp. Sta., 1944.) Deals with production and production requirements, the manner in which they are affected by changes in the combination of enterprises and production practices, and the probable effect of these changes on farm earnings in the High Plains Cotton Area. The advantage taken by farmers of improvements in machinery and power has greatly increased the efficiency of labour. Under usual conditions, pre-harvest labour amounting to 10·45 hours was required per acre of cotton with single-row horse machinery, and 6·65 hours with two-row horse-drawn implements. With two- and four-row tractor-drawn equipment the requirements for pre-harvest labour

per acre of cotton were reduced to 5·5 and 4·3 hours, respectively. A stripper type cotton harvester has been developed by the Texas Agricultural Experiment Station. A limited number of these machines was manufactured in 1943, and more were available in 1944. Two men using a two-row machine of this type can harvest as much cotton per day as 14 to 16 men can harvest by snapping. Labour saving associated with the shift to a high level of mechanization has greatly increased the crop acreage that can be operated per man. Assuming the maximum acreage of cotton that can be readily planted and cultivated, one man can operate, with the help of extra labour for hoeing and harvesting, approximately 100 acres of cropland with one set of single-row horse-drawn implements or 180 acres with two-row horse-drawn implements. This acreage can be increased to 250 by the use of two-row tractor equipment and to 450 acres with four-row tractor equipment.

391. Cotton Harvesting Equipment: Application. By J. D. Black. (*Mech. Eng.*, **67**, 1945, pp. 180, 198. From *Summ. Curr. Lit.*, xxv., **13**, 1945, p. 297.) Two kinds of cotton-harvesting equipment are mentioned. One is a mechanical stripper used on the high plains of Texas, which reduces the harvesting time to 4 or 5 man-hours per acre, and the total labour time for the crop to 8 hours per acre. The other is a mechanical picker which, combined with a 4-row tractor equipment for the other operations, reduces the labour time on Mississippi Delta cotton from 150 down to 25 or 30 hours per acre. An agronomist in the Carolina Upper Coastal Plain reports 38 bales of cotton from 25 acres on one farm without any hand labour except for picking, and adds that the cotton picking machines demonstrated in his area were successful. Whether cotton growing and harvesting on the small irregular fields in other parts of the South can be mechanized successfully is another question.

392. Significance of the Patronage Dividend as applied by Co-operative Cotton Gin Associations. By W. E. Paulson and R. T. Baggett. (*Texas Sta. Bull.* 649, 1944. From *Exp. Sta. Rec.*, **92**, 2, 1945, p. 285.) The sources and disposal of profits, the objectives of patronage dividends and the problems of determining equitable patronage dividends due to the several types of business conducted by a gin, and the profit and non-profit aspects are discussed. The running bale, lint cotton, seed cotton, and departmental and semi-departmental plans of computing dividends are described and the equitableness of each discussed. The methods of computing dividends used by three associations are discussed and compared.

393. Efficiency as Applied to Cotton Ginning Business. By W. E. Paulson. (*Texas Sta. Bull.* 654, 1944, p. 39. From *Exp. Sta. Rec.*, **92**, 4, 1945, p. 572.) Efficiency as discussed in this bulletin is confined to the ginning business in Texas. Cost as a measure of efficiency; standards of ginning business—gin income, cost of ginning, and volume of business; the profit experiences of different groups of gins; the standard costs of 1927-28 and 1937-38; profit as an index of business efficiency; size of crop, number of gins, and returns on investment; variations in ginning costs from standard costs; volume of ginning and efficient use of capital, etc., are discussed. Charts show the effect of volumes of ginnings greater and less than standard volume; relation between fixed and variable cost per bale and total cost to volume of ginning; relations among size of crop, number of operating gins, and average profit on gin investment, etc. Equations for estimating total standard costs and items of costs for different areas of the State are given in appendices.

394. Control Methods for Cotton Insects. By F. L. Thomas *et al.* (See Abs. 444.)

395. Variations in Losses among Bees as a Result of Cotton Poisoning. By F. L. Thomas *et al.* (*Beekeepers Item*, **26**, 1942, p. 58. From *Circ. No.* 107. Texas Agr. Exp. Sta., 1944, p. 54.) "Information obtained in a questionnaire survey showed that nearly 40 per cent. of more than 10,000 colonies of bees were lost in 1941 as a result of cotton poisoning. Losses ranged from none to 100 per cent. of the colonies in a yard. Variations in losses, according to the beekeepers, are apparently due to the type of machine used and time of application of dust, the amount of nectar secreted by the plants, other sources of nectar available, and the presence of sulphur in the poison mixture.

COTTON IN EGYPT.

396. EGYPT. COTTON SEASON, 1945-46. (*Cotton*, M/c., 1/9/45.) The acreage planted to cotton is officially given at 982,435 feddans, compared with 852,949 feddans last season. Advices from Alexandria state that a constant hot temperature has proved to be very favourable to the crop, flowers and bolls are in better condition than last year, and, provided no damage is sustained during the coming weeks, a good crop is in prospect.

397. EGYPTIAN COTTON. (*Cotton*, M/c., 5/5/45.) Karnak is now, quantitatively, the most important Egyptian growth, and the total supply of this variety at present is probably not far short of 4,000,000 kantars. It seems probable, however, that Karnak will not retain its quantitative importance much longer in the Egyptian crop, and that its place will be taken by Menoufi, the staple length of which is about half-way between that of Giza 7 and Karnak. The area under Menoufi last year was less than 15,000 feddans, whereas over 96,000 kantars of this strain had been ginned by March 31, so that the final ginnings may easily show a yield of 7 kantars per feddan, which is very high for a long-stapled variety and, in fact, is little below that of Ashmouni. It is expected that 65,000 feddans will be planted to Menoufi this year, and a further large increase next year; the result of this should be to reduce its premium over Giza 7 and Karnak. The high yield per feddan of Menoufi will no doubt make it popular with growers, and the same may be said of Giza 30, the new shorter-stapled variety.

398. YARN STRENGTH OF EGYPTIAN COTTON MIXINGS. By F. Dunkerley. (*J. Text. Inst.*, xxxvi., 3, March, 1945, T57.) The statement made in a previous paper, that the yarn strength of a mixing of Egyptian cottons is *nearly equal* to the weighted mean of the yarn strengths of the components, is now amended to read: "The yarn strength of a mixing of Egyptian cottons is *equal* to the weighted mean of the yarn strength of the components."

Discussing the results of the present experiments the author states that no "strength bonus" of the mixings was found. As several years of extra experience in the spinning and testing technique for small samples have been gained since the last experiments were reported, and as the precautions taken to ensure identical treatment of all samples at each stage were even more stringent, it is felt that the results obtained are representative of the true state of affairs. The reason for the previously found "strength bonus" of the mixings, which has entirely disappeared, is still a mystery, but it can now be said with confidence that mixings of two Egyptian cottons will produce yarn with a strength very closely equal to the weighted mean strength of the components. In point of fact, only one mixing deviated by as much as 2 per cent. from its expected strength, and this deviation included all possible sources of error. The yarn strengths of the mixings were, on balance, about 3 lea-product units lower than the expected strengths; this deviation is less than 0·2 per cent. and is entirely negligible.

[*Cf.* Abstr. 748, Vol. XIV. and Abstr. 175, Vol. XV. of this Review.]

399. RAW COTTON EXPORT TAX. (*Cotton*, M/c, 29/9/45.) Advices from Cairo state that the export tax on raw cotton of 20 piastres per kantar was abolished on the 24th September, 1945. During the war, when few private overseas buyers were in the market, the tax probably caused no loss of business, but with reviving activity in European and other cotton mills, and with improving shipping facilities, it is claimed that the tax might have operated to the disadvantage of Egyptian cotton in international trade.

COTTON IN OTHER FOREIGN COUNTRIES.

400. A MELHOR FIBRA DE ALGODÃO PRODUZIDA NO BRASIL. See Abstr. 491.

401. CHINA. COTTON INDUSTRY. (*Man. Guar.* 17/4/45.) In a recent letter to the Editor of the *Manchester Guardian*, Mr. Li Shing, Chairman of the China Institute, Manchester, gave some information on the general conditions in the textile areas of China at that time under Japanese occupation.

"In the Shanghai district there were some 5,000,000 cotton spindles; two-fifths of foreign capital, the rest Chinese owned. Great damage was caused by the hostilities in Shanghai, and since the occupation much has been bought up by the Japanese or has passed under the control of the Department of Industry of the puppet Government. There are now just about 1,500,000 spindles still under Chinese ownership in Central China. Some of the mills occupied by the enemy have been converted into aeroplane or general repair works. Mills not only in occupied China but also in Japan have suffered. There were 12,700,000 cotton spindles in the Japanese Isles before the war, but only some 3,750,000 are now in operation. It was not until a year ago that we discovered that the other two-thirds have been dismantled for use as scrap. This shows clearly the enemy's urgent need of iron and steel. The 3,750,000 spindles left in Japan are only just sufficient to produce goods for native use, and the enemy has been transporting large quantities of yarns and cloth from other parts of occupied China to Manchuria, both for civilian use and for exchanging for petrol from Soviet Russia, though he is not having a free hand in these transactions. In 1943 the Japanese expected a crop of 1,100,000 piculs (1 picul= $133\frac{1}{3}$ lb.) of cotton in North China, but only got just over 300,000 piculs, the rest having been taken by Chinese guerillas. In a fit of rage the Japanese ordered all the residents in North China to hand over their cotton-padded clothing as well as bed quilts. But even then they only succeeded in getting a further 300,000 piculs, which were sent to Manchuria for making munitions; much had to be burnt because of the fleas and bugs, which are flourishing owing to the lack of sanitation in the occupied areas. The Japanese were very exacting in their prices, and failed to get much of the materials they wanted from the occupied areas, but they have recently changed their tactics. It is learnt that during recent months they have been offering 50,000 Chinese dollars for a picul of cotton. In the face of dire need the Japanese in occupied China are doing their own best. They have established two 'development companies' one in North China and one in Central China, comprising 13 and 17 departments respectively, from which industrial work is directed. Thus, in Tientsin for instance, there are now a large number of factories under Japanese directorship, and the city is quite different from its old days. These works have during the recent years been assisted by some 30,000 German technicians in the medical, chemical, and aviation fields. However, and whenever, the war ends in the Far East, the recovery of the textile industry in China is going to be a tremendous task, and certainly offers very great scope to textile machinists or manufacturers anywhere in the world who are willing to co-operate with us. It should be of interest to our British textile friends, whom we have always looked upon as leaders of that particular industry, that many American firms are already making preparations by training Chinese engineers in their works or otherwise planning post-war co-operation with existing mills in China. I sincerely hope such opportunities will not be overlooked by our British friends."

402. A Review of Cotton Research in China. By C. L. Hu. See Abstr. 492.

403. Factors influencing the Development of Cotton Diseases. By L. Ling. See Abstr. 461.

404. French Textile Industry: Capacity. By R. Thiebault. (*Text. Mnfr.*, **71**, 1945, pp. 50, 60. From *Summ. Curr. Lit.*, xxv., **9**, 1945, p. 226.) The writer reviews the present state of the French textile industries, and gives particulars of the raw fibre required (metric tons per annum), supplies available in the French Empire, spinning mills and their total spindles, and weaving factories and their total looms, for cotton, wool, rayon, etc.

405. French West Africa. Sur la Présence en A.O.F. de Deux Nouvelles Espèces d'Insectes très Nuisibles et non Encore Signalées. By J. Risbec. See Abstr. 441.

406. Peru. Cotton Industry. (*Cotton*, M/c, 23/6/45.) Recent estimates of the 1945 cotton crop give a figure of 1,450,000 quintals (67,000 tons), of which 1,200,000 quintals are of Tanguis variety and 250,000 of Pima. This is slightly in excess of the 1944 crops. The weather has been very favourable and the crop is well

advanced. About 160,000 quintals of Tanguis and 20,000 quintals of Pima cotton have already been purchased, of which 60,000 quintals have been acquired by the British Ministry of Supply. The majority of the cotton not taken by Britain is believed to have been purchased for Swiss account.

407. Cultivos del Algodon Sea Island. By J. E. Wille and G. Garcia Rada. See Abs. 443.

408. The Selection Experiment with Peruvian Tanguis Cotton. By S. C. Harland. See Abs. 508.

409. Russia. Die Geschichtliche Entwicklung und Fortschritte der Kultur und Zuchtung der Baumwolle. By E. Morgenroth. (*Kuhn-Archiv.*, **60**, 1943-44, p. 315. From *Pl. Bre. Abs.*, xv., **2**, 1945, p. 148.) A study, based on Russian sources, of the historical development and progress of the cultivation and breeding of cotton in Russia.

410. Uzbek Cotton Growers' Record Success. (*Cotton*, M/c, 7/4/45.) From an article by L. Sosonkin received by *Cotton* from the Assistant Editor of the Press Dept. of the Soviet Embassy, London, we learn that at a conference held recently a letter was addressed to Marshal Stalin reporting on the achievements of the 1944 cotton season. The yield increased by 60 per cent. and reached an average of 11·3 cwt. per hectare (1 hectare = approximately $2\frac{1}{2}$ acres). The raw cotton deliveries to the State increased by 311,000 tons, compared with 1943. Industrial enterprises contributed a sizable share to these achievements by supplying in 1944 five times as many spare parts for tractors and other agricultural machines as in the previous year. The conference discussed the achievements of the best workers, took stock of available resources, and on that basis unanimously decided to work in 1945 for an increase in the cotton yield, and to produce a million tons of cotton. This will be achieved by a further rise of 25 to 30 per cent. in labour productivity, by increasing the productivity of the available tractor fleet by 30 to 40 per cent. and by a number of other organization measures. It was further decided to challenge the cotton growers of Turkmenistan, Kazakstan, Tajkistan and other cotton-growing republics to a contest in the production of cotton.

411. Turkey. Keimlingskrankheiten der Baumwolle in Sudwest-Anatolien. By H. Bremer. See Abs. 472.

SOILS, SOIL EROSION, AND MANURES.

412. Influence of Nature of Soil Colloids and Degree of Base Saturation on Growth and Nutrient Uptake by Cotton and Soybeans. By A. Mehlich and W. E. Colwell. (*Soil Sci. Soc. Amer. Proc.*, 1943, **8**, 1944, p. 179. Item 10550. *Bibliog. of Agr.*, March, 1945.)

413. Some Modifications in the Neubauer Method. By W. R. McGeorge. (*Soil Sci.*, **58**, 5, 1944, p. 389. From *Exp. Sta. Rec.*, **92**, 5, 1945, p. 622.) In a study of certain modifications of procedure in the Neubauer seedling test, it was shown that both the ratio and the absolute weight and number of seedlings must be maintained at 100 : 100, but in availability studies informative data can be obtained by modifying the procedure to use lower weights of soil. The Neubauer test, like the chemical analysis of a soil, is an empirical test because the conditions must be closely adhered to in order to obtain quantitative values. When the Neubauer test is modified by comparing uptake of nutrient elements by rye and by other seedlings, the data are confused by lack of uniformity of seed. There is, however, strong evidence that the availability as measured with rye seedlings is applicable to many other crops.

414. The Value of Strip Cropping. By W. A. R. Cowdry and R. W. George. (*Queensland Agr. J.*, January, 1945, p. 14.) One of the most efficient and economical methods of reducing run-off and soil loss on slopes of less than 4 per cent. is strip cropping. Data obtained at the Biloela Research Station have shown that Rhodes grass definitely retards run-off and thus allows greater penetration of general rains and any storm rains over $1\frac{1}{2}$ inches. It has been found that, several days after a storm rain, much greater quantities of moisture were available at 18 inches under

growing Rhodes grass than in either bare fallowed land or in an adjacent cotton crop.

415. A New Method for Observation of Micro-organisms in the Soil in Vivo. (*Soils and Fertilizers*, vii., 3, 1944. From *Trop. Agr.*, March, 1945, p. 60.) The Strugger method with acridine orange for live staining was used for direct fluorescence observation of live soil bacteria. The soil is screened and shaken up in 1:5000 dilution of acridine orange (tapwater); part of the suspension is observed. All dead matter appears red to red-brown; live bacteria are green. The bulk of the organisms is tightly held by the humus and does not separate by shaking; only a few dead bacteria are found. The number of live bacteria of various kinds varies from 100 million per gm. of soil for autumn or winter in poor soils, to 1/1½ thousand millions in rich compost.

416. Further Experiments to Determine the Organisms Responsible for Decomposition of Cellulose in Soils. By C. E. Skinner and E. M. Mellem. (*Ecology*, **25**, 3, 1944, p. 360. From *Exp. Sta. Rec.*, **92**, 1, 1945, p. 20.) On adding finely divided filter paper to acid soils, 60 per cent. saturated with water, with or without nitrates, no evidence was found of the activity of cellulose-decomposing bacteria, although mould growth increased greatly. In soils with an initial pH above 5·0, both moulds and cellulose-decomposing bacteria showed a significant increase. The conclusion of Dubos that both aerobic bacteria and moulds take part in the decomposition of cellulose in non-saturated soils, unless they are distinctly acid, is shown to be correct.

417. Comparison of Mixed Fertilizers Produced from Various Nitrogen and Phosphoric Acid Sources. By R. P. Bartholomew. (*Arkansas Sta. Bull.* 450, 1944. From *Exp. Sta. Rec.*, **92**, 3, 1945, p. 341.) Results are given of investigations at the Cotton Branch Experiment Station on Richland silt loam to determine the efficiency of neutral fertilizers, the efficiency of acid-forming fertilizers, the effect of calcium, magnesium, sulphur, and manganese content of fertilizers on their efficiency, the relative efficiency of phosphates of different solubility, and the influence of different proportions of ammonium and nitrate nitrogen on the efficiency of the fertilizer. Acid and neutral fertilizers containing 36 lb. of nitrogen, 60 lb. of phosphoric acid, and 24 lb. of potash were applied under cotton, in order to determine the relative effectiveness of the mixtures in producing increased yields of cotton. A fertilizer made from ammonium sulphate, superphosphate, and muriate of potash was used as a standard for comparison. Ammonium nitrate was the chief source of nitrogen used either as the only source of nitrogen or to supplement the nitrogen contained in the phosphates. Urea and sodium nitrate were also used in a few mixtures to supplement the nitrogen in diammonium phosphate. Phosphoric acid was supplied as monoammonium phosphate, diammonium phosphate, ammoniated superphosphate, magnesium ammonium phosphate, superphosphate, dicalcium phosphate, tricalcium phosphate, and rock phosphate. Muriate of potash was used mostly for the source of potash, but in three mixtures half of the potash was added as the sulphate. Finely ground limestone was used in all mixtures to make physiologically neutral fertilizers, although in three half of the basic material was added as magnesium carbonate. No mixture stood out as being superior to all other mixtures in the evaluation of the average results of 13 years. However, there was considerable variation in yields of seed cotton produced from the different mixtures, and significant differences were noted between certain mixtures. The standard mixture—ammonium sulphate, superphosphate, and muriate of potash—produced an average increase in yield of 421 lb. seed cotton per acre. About one-fourth, 107 lb., of the increase was attributed to the phosphoric acid and three-fourths to the nitrogen and potash in the mixture. Two mixtures of the acid group produced significantly larger yields of seed cotton than the standard. One made from nitrate of soda, diammonium phosphate, and muriate of potash, produced 115 lb. more seed cotton per acre, and the other, mixed from ammonium nitrate, dicalcium phosphate, and muriate of potash, produced 47 lb. more. Four of this group of mixtures produced significantly smaller yields than the standard, and four were considered as of equivalent value. Mixtures

made from the same materials as the acid fertilizers plus limestone or limestone and magnesium carbonate to make neutral fertilizers, all produced larger yields than the same mixtures without basic materials. The average increase ranged from 13 to 120 lb. of seed cotton per acre. The effectiveness of all of the mixtures was increased as a result of the addition of basic materials. The increases in yields were not, in all cases, significant. All physiologically neutral complete fertilizers produced more seed cotton than the physiologically acid standard. The value of the neutralizing material is shown by the fact that four of the same mixtures, but without limestone, produced significantly smaller yields than the standard.

418. The Uptake of Nutrients by the Cotton Plant when Fertilized with Acid Forming and non-Acid Forming Fertilizers combined with Different Rates of Potash. By J. J. Skinner *et al.* (*Ga. Sta. Bull.* 235, 1944. From *Exp. Sta. Rec.*, **92**, 5, 1945, p. 649.) Profitable increases in yields of seed cotton have been produced by neutralizing the fertilizer with dolomitic limestone on most of the principal soil types of the south-eastern Cotton Belt, including some soils in Georgia. Neutralizing the fertilizer has not materially affected the crop's requirement for K, for cotton made essentially the same yield increase regardless of the K content of the fertilizer. The lower N percentage in Deltapine cotton plants on Clarksville gravelly loam grown with non-acid-forming fertilizers than in plants grown with acid-forming fertilizers differs from results on Tifton sandy loam, being due perhaps to differences in response to dolomitic limestone on the two soils and to the character of the soil. Fertilizers neutralized with dolomitic limestone, in general, did not materially change the composition of cotton plants as compared with plants grown with acid-forming fertilizers, except in Mg content. Early availability to cotton of Mg in dolomitic limestone is indicated by the larger amount of Mg in the plants in early growth, and throughout the growing period. In addition to the N, P, and K taken up by cotton plants, large amounts of Ca and appreciable amounts of Mg were absorbed. The larger plants with increased yields produced by non-acid-forming fertilizers contained larger amounts of nutrients per plant. Cotton fertilized with such fertilizer made larger and earlier growth and absorbed more nutrients per plant early in the season than plants receiving an acid-forming fertilizer, suggesting that the limestone in fertilizers makes the nutrients more readily available. Increasing amounts of applied K (0, 3, 6, and 9 per cent. K_2O) increased the K percentage in the plant and reduced the Mg percentage at all growth stages. There were consistent but small decreases in the percentages of N, Ca, and P in the plant as K applications increased, although the total amount of all nutrients per plant rose with the amount of K applied. The effect on plant composition of K was greater than that of dolomitic limestone in fertilizers with the exception of the greater Mg content from dolomitic limestone. Increased rates of applied K were accompanied by increased uptake per plant of K and an increased uptake per plant of other nutrients.

419. Fertilizer Practices for Cotton on Soils of Tallahatchie. By J. Pitner. (*Miss. Farm Res.*, **7**, 12, 1944, p. 2. From *Exp. Sta. Rec.*, **92**, 5, 1945, p. 623.) Results of soil management studies on Minter fine sandy loam, in the vicinity of Greenwood, Miss., show that increases in yield of seed cotton were obtained by applying commercial fertilizer in addition to growing and turning under vetch. Nitrogen was found to be the fertilizer element most badly needed.

420. Effect of Nitrogen and Phosphorus on the Yield and Root Rot Responses of Early and Late Varieties of Cotton. By L. M. Blank. (*J. Amer. Soc. Agron.*, **36**, 1944, p. 875. From *Circ. No.* 107, Texas Agr. Exp. Sta., 1944, p. 51.) A study of the effect of nitrogen and phosphorus fertilizers in combination with early and late maturing varieties of cotton upon the incidence of root rot and the yield of seed cotton was made on two soil types in Texas over a period of three years. The mean effect of nitrogen was to decrease the amount of disease by a significant or highly significant margin in two of the three years at each location, and yields were increased by a highly significant margin in all years at both locations. Phosphorus had no appreciable effect upon disease or yield at one location, while at the second location both disease and yield were increased in two of the three years.

Although early varieties as a group were as susceptible to disease as the later varieties, they outyielded the latter group by a highly significant margin in all years at one location and in two of the three years at the second location.

421. PLOUGHING UNDER LEGUMES INCREASES YIELDS OF COTTON AND CORN. By E. B. Reynolds *et al.* (*55th and 56th Ann. Rpts.* Texas Agr. Exp. Sta., 1942, 1943, p. 39.) At Tyler in 1942 and 1943 ploughing under vetch, fertilized with superphosphate and potash, practically doubled the yield of corn and increased the yield of cotton 80 per cent. as compared with yield on unfertilized-land. Ploughing under fertilized vetch at Nacogdoches increased the yield of cotton 60 per cent. Although cotton in the experiments at College Station was a practical failure in 1943 due to extreme drought, fertilized vetch had increased the yield of cotton 43 per cent. during the last seven years.

422. EFFECT OF THE USE OF WINTER LEGUMES ON YIELDS OF COTTON, CORN, AND RICE. By M. Nelson. (*Arkansas Sta. Bull.* 451, 1944. From *Exp. Sta. Rec.*, **92**, 3, 1945, p. 359.) Hairy vetch and crimson clover gave most consistent production of organic matter and added large amounts of N to the soil. Austrian winter peas did not produce as consistently although producing large average crops of organic matter. Bur-clover and red clover also made large average amounts of organic matter when grown for cotton and corn, but amounts produced fluctuated greatly from year to year. Alfalfa, white sweet clover, and yellow trefoil did not seem to be adapted to conditions in the cotton and corn experiments. Large increases in cotton and corn resulted when large amounts of legumes were turned under, hairy vetch and crimson clover giving the most consistent performance. The average increase in yield of seed cotton after winter oats turned under was only about one-third of that following adapted legumes. Value of winter legumes as green manures followed by cotton, corn, and rice appeared associated with the amount of N added to the soil. Estimates were that 30 to 50 per cent. of average yields of cotton and corn resulted from turning under organic matter containing N.

423. INFLUENCE OF CERTAIN SOIL AMENDMENTS ON THE YIELD OF COTTON AFFECTED BY THE *Fusarium-Heterodera* COMPLEX. By J. A. Pinckard and O. A. Leonard. (*J. Amer. Soc. Agron.*, xxxvi., **10**, 1944, p. 829. From *Rev. App. Mycol.*, xxiv., **3**, 1945, p. 99.) Neither the total amount of infection nor the distribution of *Fusarium vasinfectum* and *Heterodera marioni* in Ruston and Sarpy sandy loams in Mississippi was influenced by any of the fertilizers used in a series of trials covering a period of eight years on the former and three on the latter soil, but the average annual yields were greatly increased and the extent of the injury reduced by most of the amendments, notably stable manure at the rate of 4 tons per acre and upwards, and rotted lucerne hay buried in the furrows. It is suggested that unfavourable conditions for cotton root development in the field predispose the plants to infection by *F. vasinfectum*, the incidence of which might be decreased by improvements in the culture of winter legumes and ploughing down the tops, thereby throwing the bulk of the vegetation under the future cotton rows.

424. THE EFFECT OF SOIL MOISTURE AND NITROGEN ON COTTON FRUITING. By A. A. Dunlap. (*55th and 56th Ann. Rpts.*, Texas Agr. Exp. Sta., 1942 and 1943. In pot-culture experiments with cotton, increases in the number of bolls per plant were in proportion (within certain limits) to the amounts of either water or nitrogen (ammonium sulphate) added to the soil. The increases obtained by applying nitrogen to relatively dry soils, however, were smaller than those obtained by the use of adequate water alone. The percentage of bolls shed was fairly uniform in the various treatments, except when high-nitrogen plants were changed from a high to low moisture level after the plant had attained a good size and had developed many immature fruiting forms.

425. FORMATION OF HUMUS FROM PLANT RESIDUES AND MANURES BY ANIMALCULES. (*Soils and Fertilizers*, vii., 3. From *Trop. Agr.*, March, 1945, p. 60.) Each genus of the smaller soil fauna seems to perform a specific function in the transformation of organic matter in the soil. The most numerous of the lesser fauna are the nematodes, of which 200 and more are often found in 1 c.c. of soil. Most of these are harmless to

living plants but play an important rôle in the decomposition of cellulosic plant residues. Different kinds of earthworms behave differently. *Octolasium* spp. feed on humified material which is thereby destroyed; *Lumbricus* spp. feed on fresh plant residues which are excreted as humus intimately mixed with mineral matter. There is evidence that diplopods, slugs, land lice, midges, *Collembola*, larvae and caterpillars take an active part in the humification of different organic materials. Attempts were made to determine the amounts of humic matter (insoluble in acetyl bromide) formed per day by different animals from different raw materials. In 100 days an earthworm produced 0·53 gm. of humus from black-alder leaf residues, and a louse 0·09 gm. The corresponding figures for beech leaves were 0·24 and 0·02 gm. Earthworms appeared to be the most active humus formers. Though the amount of humification per insect or animal is small the total numbers of the soil fauna are often very high and may account for a considerable proportion of the humus produced. The animal population of dung heaps and composts is usually much higher than that of soils, and varies roughly with the cellulose content. It is, however, not yet possible to state whether the interaction of small animals in the rotting process is the most desirable.

STATISTICAL TREATMENT, CULTIVATION, GINNING, USE OF SEED, ETC.

426. Estimating Cotton Supplies by the Correlation Method. By H. M. Leake. (*Fibres*, September, 1945, p. 95.) The method of correlation is explained, and some of the factors that should be taken into account when attempting to estimate cotton crops are discussed.

427. A New Weed Killer. (*E. Afr. and Rhod.*, 5/4/45, p. 730.) Research chemists on the staff of Imperial Chemical Industries have discovered a revolutionary type of weed-killer, named Methoxone, which kills weeds but leaves the crop unharmed. In practical experiments various weeds have been eradicated from fields of wheat, barley, and oats, and buttercups from grassland, without injuring the grass. This discovery may prove of great benefit to tropical agriculture.

428. Saw-Ginned and Roller-Ginned Long-Staple American Upland Cotton: Spinning Quality. By S. Williams and J. Towery. (*Cotton*, U.S.A., **109**, 4, 1945, p. 110. From *Summ. Curr. Lit.*, xxv., **13**, 1945, p. 306.) Three strains of Acala cotton were ginned by the saw and roller methods and tested for fibre qualities (grade, staple, fineness, immaturity, Pressley bundle strength) spun into carded yarns of 11, 22, 33, 44, and 66s. counts under controlled conditions, and waste percentages, nep counts, yarn strengths and yarn appearances were observed. The data are summarised in tables and justify the contention that there are no significant advantages in roller ginning to offset the increased economies of saw ginning.

429. Economic and Cost Study of Cotton Ginning in Central Mississippi. By D. G. Miley and A. L. Roberts. See Abs. 377.

430. Efficiency as Applied to Cotton Ginning Business. By W. E. Paulson. See Abs. 393.

431. Macarthy Roller Gin: Action. By F. Dunkerley. (*Text. Wkly.*, **35**, 1945, pp. 976, 1024. From *Summ. Curr. Lit.*, xxv., **12**, 1945, p. 278.) A working account of the action of the Macarthy roller gin and of ginning practices in Egypt.

432. The Storage of Cottonseed. I. Effect of Moisture and of Treatments with Acid and Alkali on Rate of Formation of Free Fatty Acids in Stored Cottonseed. By M. L. Karon and A. M. Altschul. (*Pl. Phys.*, **19**, 2, 1944, p. 310. From *Exp. Sta. Rec.*, **92**, 6, 1945, p. 756.) Increased moisture content of the seed increased the rate of hydrolysis of the glycerides most rapidly between 15 and 18 per cent. Ammonia or hydrogen chloride gas treatment of the seed was found greatly to retard the formation of free fatty acids. Ammonia treatment retarded the darkening of the oil and yielded oil of a colour much lighter than that of oil from the untreated seed. The hydrolysis rate of glycerides in the oil in cottonseed

was: $\frac{dF}{dt}=k(F)\ (100-F)$ F being the percentage of free acids, $100-F$, percentage unhydrolized fat, and k, the rate constant.

II. THE EFFECT OF AMMONIA TREATMENT ON THE FREE FATTY ACIDS AND COLOUR OF THE SEED OIL, AND ON THE RATE AND DEGREE OF HEATING OF THE SEED. By A. M. Altschul *et al.* (*Oil and Soap*, **20**, 12, 1943, p. 258. From *Exp. Sta. Rec.*, **92**, 6, 1945, p. 756.) Treatment of moist cottonseed with ammonia prior to storage reduced self-heating of the seed and the rate of free fatty acid formation during storage. The colour of oils obtained by solvent extraction from ammonia-treated cottonseed was lighter than that of oils obtained from untreated cottonseed.

433. DETERMINATION OF FREE GOSSYPOL IN COTTONSEED MEAL, A COLORIMETRIC METHOD. By C. M. Lyman *et al.* (*Indus. and Eng. Chem.*, **15**, 1943, p. 489. From *Circ. No.* 107. Texas Agr. Exp. Sta., 1944, p. 38.) A rapid, accurate and reliable method for the determination of free gossypol in cottonseed meal is described. The method is based on the measurement of the change in colour which takes place when aniline is added to an ether extract of cottonseed meal. Details of the procedure and experiments concerning the reliability of the method are given.

434. PROCESSING COTTONSEED MEAL, A MANUFACTURING METHOD FOR ELIMINATING TOXIC QUALITIES. By C. M. Lyman *et al.* (*Indus. and Eng. Chem.*, **36**, 1944, p. 188. From *Circ. No.* 107, Texas Agr. Exp. Sta., 1944, p. 38.) Cottonseed meal was prepared by the hydraulic method under a variety of different processing conditions including time, temperature, and moisture content. The samples were tested for toxic qualities by animal feeding tests, and the gossypol content was determined by chemical analysis. Satisfactory conditions were found for the preparation of meal in which no indication of toxic qualities could be detected by guinea-pig feeding tests. This can readily be accomplished without adding chemicals. The analysis for free gossypol by a new colorimetric method proved to be a reliable means of determining whether any given sample of meal would prove toxic in animal feeding tests. The simplicity of the new analytical procedure makes it particularly useful in studies of this kind.

435. L'UTILISATION DES SOUS-PRODUITS DE PLANTES TEXTILES DOIT RENFORCER LEUR DEVELOPPEMENT. By Y. Maury. (*Industr. Text.*, **60**, Juin, 1943, p. 112. From *Index Bibliog.*, **7**, 1943-44, p. 1041.) Deals with the utilisation of cottonseed and linseed in the manufacture of edible oils, food for cattle, fertilizers, etc.

PESTS, DISEASES, AND INJURIES, AND THEIR CONTROL.

436. TWO NEW INSECTICIDES, DDT AND 666. By E. McC. Callan. (*Trop. Agr.*, June, 1945, p. 98.) A brief account of the discovery of DDT and 666 and of their great possibilities for use in the control of insect pests.

437. DDT, THE NEW INSECTICIDE. A GENERAL SURVEY AND SOME POSSIBLE PAINT APPLICATIONS. By G. A. Campbell and T. F. West. (*J. Oil. Col. Chem. Ass.*, **27**, 294. Slough, 1944, p. 241. From *Rev. App. Ent.*, xxxiii., Ser. A. **5**, 1945, p. 137.) The first part of the paper gives descriptions of the research resulting in the discovery of the insecticidal properties of DDT, and the second is an account of investigations on the use of DDT in paints against the house-fly. The authors give details of the original investigations on moth-proofing agents, and show the types of molecular structure that were found to be associated with toxicity to clothes moths and an affinity for wool fibre. Later studies are then described in which a wider range of substances was investigated on other insects, comparing formulæ of effective and ineffective synthetic organic stomach poisons, and a biological analysis of the process of contact poisoning, which suggested that a contact insecticide that does not act through the tracheal system must be lipoid-soluble. This led to the preparation of DDT, which showed an insecticidal effect not previously observed in a synthetic substance. The molecular structure of a number of compounds related to DDT are shown, with information on their effectiveness as contact insecticides for houseflies, and the method of action of DDT is discussed.

438. Organic Iodine Compounds tested against Insects, Fungi, and Bacteria. A Review of the Literature. By C. Verne Bowen. (Iodine Educational Bureau, Inc., New York. ? 1944. From *Rev. App. Mycol.*, xxiv., **3**, 1945, p. 108.) A list of the organic iodine compounds so far tested against insects, fungi, and bacteria, with notes on their activity in this respect accompanied by references to the relevant liter-ture. The bibliography comprises 111 titles and there is a list of the patents cited.

439. Enzyme Activity as a Factor in Insect Physiology and Toxicology. By Dr. H. Hurst. (*Nature*, 18/8/45, p. 194.) In this article an attempt is made to define the biophysical factors which influence the uptake of insecticides by the insect cuticle and internal tissue receptors. Some new factors in insecticidal activity are described, depending on the discovery that phenoloxidase activity in the cuticle and sensitive tissue receptors may be greatly modified by the selective environmental influence of the structural components associated with the enzymes *in vivo*. (The term "receptors" is frequently used in pharmacology to indicate the sites of action in biological systems with which drugs are supposed to combine or exert specific actions.)

440. Determination and Evaluation of the Resistance of Textiles to Insect Pests. By H. E. Wilde. (*Rayon Text. Mo.*, **25**, 9, 1944, p. 128. From *Exp. Sta. Rec.*, **92**, 4, 1945, p. 601.) This report considers briefly the methods available for evaluating moth resistance of treated fabrics, the limitations of the methods, and the findings and conclusions of the various laboratories co-operating in a comparison of these methods.

441. Sur la Présence en A.O.F. de Deux Nouvelles Espèces d'Insectes très Nuisibles et non Encore Signalées. By J. Risbec. (*Notes Afr.*, No. 22, p. 14, Dakar, 1944. From *Rev. App. Ent.*, xxxiii., Ser. A, **6**, 1945, p. 165.) The pink bollworm, *Platyedra gossypiella*, Saund., and the potato beetle, *Leptinotarsa decemlineata*, Say., are recorded for the first time from French West Africa, where the former was found in Upper Senegal and the latter on tomato in the Ivory Coast. Very brief notes are given on their appearance and habits, together with the distribution of pink bollworm in neighbouring parts of Africa and in other French Colonies, including New Caledonia, New Hebrides and Algeria, and a summary of the spread of *L. decemlineata* in North America and Europe.

442. A Report on the Status and Control of Insect Pests of Cotton in the Lower River Districts of Nyasaland. By E. O. Pearson and B. L. Mitchell. See Abs. 333.

443. Cultivos del Algodon Sea Island. By J. E. Wille and C. Garcia Rada. (*Bol. Direcc. Agric. Peru*, **16**, 48-51, Lima, 1944, p. 235. From *Rev. App. Ent.*, xxxiii., Ser A, **5**, 1945, p. 132.) Plantings of Sea Island cotton in several valleys to the south of Lima were found in 1943 to be in an unhealthy state and infested by *Anomis texana*, Ril., *Mescinia peruella*, Schaus, *Dysdercus ruficollis*, L., *Anthonomus vestitus*, Boh, *Aphis gossypii*, Glov., *Thrips* sp. *Empoasca* sp., *Dikraneura* sp. and *Tetranychus peruviensis*,* McG. The poor condition of the plants was thought to be due to climate rather than to the infestation, but it was observed that the last five pests were much less numerous on neighbouring plantations of Peruvian varieties of cotton, which have hairy leaves.

(* It is stated by Dr. E. A. McGregor that the mite described as *Tetranychus peruviensis* is unknown to him, and is possibly one that he described as *T. peruvianus* in 1917, and subsequently transferred to the genus *Paratetranychus*.)

444. Texas. Control Methods for Cotton Insects. By F. L. Thomas *et al.* (*55th and 56th Ann. Rpts.*, 1942 and 1943. Received 1945.) Flea hoppers can be controlled by sulphur applied in the early stages of infestation at the rate of 12-15 lb. per acre. Temperatures must be reasonably high. Boll weevils and leaf worms can be controlled by the use of calcium arsenate at the rate of 5 lb. per acre. One application is usually sufficient for leaf worms until the broods overlap, but three applications at 7-day intervals are oftentimes required to control boll weevils. Bollworm can be controlled by the use of calcium arsenate, cryolite, arsenate of lead, or basic copper arsenate and sulphur 1 to 2 at the rate of 10 to 15 lb. per acre, usually

made in three applications 5 days apart. The first application for bollworms should be made when the young worms are about ⅛ inch in length, and the succeeding applications should not be delayed longer than 5 days since the young bollworms grow very rapidly. When the worms reach a size of ½ inch in length or greater, the application is less effective and may not kill them. Most dusting applications should be made when the atmosphere is still. Exact and precise instructions must be followed if control is to be effective.

445. CONTROL OF COTTON APHID WITH DIFFERENT FORMS OF ROTENONE AND NICOTINE. By J. C. Gaines. (*J. Econ. Ent.*, **37**, 6, 1944, p. 728. From *Exp. Sta. Rec.*, **92**, 6, 1944, p. 813.) In the tests reported the calcium arsenate-sulphur-rotenone mixtures used were effective in preventing the increased development of aphids on cotton which occurred when the arsenical alone was applied, but they were not as effective in aphid control as alternating the applications of calcium arsenate with the arsenate containing 2 per cent. nicotine sulphate. On the most fertile soils—where several applications of the arsenical are almost always needed for insect control—the latter procedure should be profitable; on upland soils—where fewer applications are needed—a single "clean-up" application may be relied upon to control aphid infestation in those years when it becomes serious.

446. BOLL WEEVIL MENACE TO TEXAS COTTON CROP. (*Cotton*, M/c, 11/8/45.) A report from the Texas Agricultural Experiment Station states that the weevil infestation continues to increase, and now threatens to cause considerable damage throughout most of the southern half of the State, while in the northern portion weevils have been found in a much greater percentage of fields than during the past six years. The average boll weevil infestation increased from 36 to 41·3 per cent. during the last week in June. 274 fields in 28 counties were inspected. Very little poison has been applied, partly due to wet fields. The finding of several specimens of leafworms was reported by federal entomologists in Cameron County and across the Rio Grande in Mexico. The recent heavy rains destroyed a large percentage of the fleahoppers that were infesting cotton in North Texas cotton fields. Bollworms have appeared in increasing numbers in the cotton fields of the south central portion of the State.

447. INSECTICIDE TESTS FOR BOLLWORM CONTROL. By J. C. Gaines. (*J. Econ. Ent.*, **37**, 6, 1944, p. 723. From *Exp. Sta. Rec.*, **92**, 6, 1945, p. 814.) Texas cotton planters have not been entirely successful in the economical control of the bollworm with commercial calcium arsenate, and investigations have been made during recent years in an effort to find a substitute material. . . . In 1942 basic copper arsenate proved the most effective of any insecticide used against bollworm; the high yields resulting from its use appeared to be due partly to the presence of copper. The two treatments resulting in highest gains were basic copper arsenate and alternate applications of calcium arsenate and lead arsenate in a schedule of treatments for both weevil and bollworm control. When bollworms occurred alone high gains were also made with the use of cryolite and lead arsenate.

448. RESIDUAL EFFECTS OF INSECTICIDES ON THE COTTON LEAFWORM (*Alabama argillacea*). By E. E. Ivy and K. P. Ewing. (*J. Econ. Ent.*, **37**, 4, 1944, p. 513. From *Exp. Sta. Rec.*, **92**, 3, 1945, p. 393.) In field plots in Texas, several treatments with lead arsenate or basic copper arsenate dust gave protection against the cotton leafworm for over two months following the last application and heavy rainfall; adjacent cotton dusted with calcium arsenate or cryolite was defoliated. In cage tests on field-growing cotton dusted twice and exposed to 6·93 in. rainfall after the second application, percentage reductions in numbers of leafworms 5 days after this treatment were with basic copper arsenate-sulphur (1-1) 82, lead arsenate 79, calcium arsenate 51, and cryolite 38.

449. *Heliothis virescens* AS A PEST OF COTTON, WITH NOTES ON HOST PLANTS IN PERU. By E. J. Hambleton. (*J. Econ. Ent.*, **37**, 5, 1944, p. 660. From *Exp. Sta. Rec.*, **92**, 4, 1945, p. 538.) The tobacco budworm has long been known as a serious pest in the tobacco sections of Florida, Georgia, Alabama, and Louisiana, but only within the past ten years have observations shown its increasing importance as a cotton pest.

Thus far there is no evidence to justify the hypothesis of a distinct biological race of the insect as a possible explanation for its comparatively recent destructive occurrence on cotton. Possibly a better interpretation of the fact could be gained from studies in localities where the insect is a pest of cotton, in order to determine its food plants other than cotton, the ecology of the areas where cotton is cultivated, and the rôle natural enemies play in effecting changes over a period of years. Data are presented and discussed in detail regarding the occurrence of the pest on cotton in Brazil and Peru and its host plants in the latter country—some 18 species including such common crop plants as flax, tomato, beans, and squash being listed with accompanying notes.

(*Cf.* Abstr. 147, Vol. XIX. of this Review.]

450. New Hypotheses for Prediction of the Swarming of the Desert Locust. By M. L. Roonwal. (*Bull. Ent. Res.*, **35**, 4, 1945, p. 391. From *Rev. App. Ent.*, xxxiii., Ser. A, **5**, 1945, p. 136.) Adults of the gregarious phase of *Schistocerca gregaria*, Forsk., are known to possess six eye-stripes, while those of the ph. *solitaria* usually have seven. From an analysis of the available statistical data from India, the author concludes that a locust population may be considered on its way towards the acquisition of ph. *gregaria* characters if examination of a sufficiently large sample shows that more than 80 per cent. of the individuals have six stripes, or that the percentage of males among the six-striped individuals is not much greater than 50, or that the proportion of six-striped individuals is materially above 82 per cent. in males and 60 per cent. in females.

451. A Short Account on the Propagation and Control of the Desert Locust *Schistocerca gregaria* Forsk., in some parts of Arabia. By M. Hussein. (*Bull. Soc. Fouad 1er Ent.*, **27**, Cairo, 1943, p. 159. From *Rev. App. Ent.*, xxxiii., Ser. A, **7**, 1945, p. 228.) The movements of swarms and breeding of *Schistocerca gregaria*, Forsk., in five areas in the coastal plains of Asir and Hedjaz and in north-eastern Arabia from December, 1942, to June, 1943, are summarized, and notes are given on its abundance, the stages and phases observed, climatic conditions, vegetation, and the control measures (chiefly the application of poison baits) adopted in each of the areas.

452. Biological Notes on *Sinoxylon sudanicum*, Lesne, and its Parasites in South India. By P. N. Krishna Ayyar and V. Margabandhu. (*J. Bombay Nat. Hist. Soc.*, **44**, 3, 1944, p. 460. From *Rev. App. Ent.*, xxxiii., Ser. A, **6**, 1945, p. 164.) The results are given of observations on the Bostrychid, *Sinoxylon sudanicum*, Lesne, in southern India, where it is common in weakened or wilting green plants of Cambodia cotton, particularly in October-January, and is an alternative host of the Braconid, *Spathius critolaus*, Nixon, an important parasite of the cotton stem weevil, *Pempherulus affinis*, Faust. The larvæ and adults tunnel in the stems; cotton plants pulled up at the end of the season and stacked from April to August are heavily infested, and breeding is therefore continuous. There are four generations a year, of which the adults are present in September-October, December-January, April-May, and July-August. In cages, females made egg chambers in cotton stems in about four days, the egg and larval stages together lasted about 30-32 days, and the pupal stage 13-14. The adults usually entered the plants at the nodes and showed a strong preference for Cambodia cotton, ignoring certain other malvaceous plants and also bamboos, though they bored in stalks of *Acacia* and mango to some extent. Females of *S. critolaus* paralyse the mature or medium-sized larvæ and deposit one or two eggs on each. The parasite consumes the entire contents of the host and pupates in its tunnel. Other species of *Spathius*, particularly one near *labdacus*, Nixon, and three undetermined *Chalcidoids* were also observed to parasitize *Sinoxylon*, and the predaceous mite *Pediculoides ventricosus*, Newp., destroyed the immature stages of both host and parasites in the laboratory.

453. On the Biology of *Dysdercus howardi*, Ballou. III. The Effect of Temperature and Humidity on the Life Cycle. By E. I. MacGill. (*Bull. Ent. Res.*, **35**, 4, January, 1945, p. 301.) In his paper "Insects and Climate" Uvarov stresses the need to determine the optimum conditions and the limits of temperature

and humidity for the development of all stages of insects of economic importance. The present paper is an account of an attempt to define these conditions for one of the cotton stainers, *Dysdercus howardi*, Ballou. The experiments are not complete as, unfortunately, the stock of insects died out, and so far it has not been possible to obtain further supplies from Trinidad. The following conclusions have, however, been arrived at.

The optimum temperature for the survival and incubation of the eggs in a saturated atmosphere was approximately 27° C. The temperature range for the development of the eggs was 19-32° C. Relative humidities of 75 per cent. and higher gave suitable conditions for the development of the eggs; 30 per cent. relative humidity was lethal to the eggs. The "threshold of development" for the eggs is considerably lower than the lowest temperature at which eggs will hatch. The range of temperature appears to be wider and the "threshold of development" lower at 82 per cent. and 75 per cent. than at 100 per cent. relative humidity. There is a correlation between the degree of absolute humidity and the incubation period. The length of the life-cycle is approximately twice as long at 20° C. as at 27° C. The optimum temperature for the survival of nymphs to reach the adult stage is nearer 27° C. than 20° C.

[*Cf.* Abstr. 431, Vol. VIII., 126, Vol. XIII., 175, Vol. XIX. of this Review.]

454. ÉTUDE COMPARÉE SUR LA BIOLOGIE DE *Dysdercus nigrofasciatus* STAL, ET *Dysdercus melanoderes*, KARSCH. By J. M. Vrydagh. (*Publ. Inst. Nat. Étude Agron. Congo Belge*, Ser Sci. No. 31, Yangambi, 1942. From *Rev. App. Ent.*, xxxiii., Ser. A, **4**, 1945, p. 127.) The species of *Dysdercus* found on cotton at Bambesa in the Belgian Congo include *D. superstitiosus*, F., *D. nigrofasciatus*, Stal, and *D. melanoderes*, Karsch. Some workers have suggested that the last two are merely forms of *D. superstitiosus*, but the author rejects this view, as he found that they would not interbreed with it. They are more closely related to one another, but it appears from the investigations described in this paper that they are best regarded as distinct species that have become differentiated biologically and in coloration by segregation, though they can still produce fertile hybrids and interbreed in nature where their range overlaps. No reliable distinguishing character was found in the genitalia. *D. nigrofasciatus* is widely distributed throughout tree savannah in Africa, whereas *D. melanoderes* appears to be confined to humid equatorial forest. At Bambesa, on the northern limit of the forest, *D. nigrofasciatus* is present throughout the year, but *D. melanoderes* disappears in the third week of December, at the beginning of the dry season. In hybridisation experiments, the fertility of the F_1 generation was only moderate, there was a tendency to inherit the characters of the female parent, the sex-ratio was unbalanced, and some individuals showed exceptional longevity. The F_2 generation comprised a continuous series of intermediate types that sometimes gave rise to new aberrant types when crossed. Fecundity became normal in the F_3 generation. In the course of rearing *D. nigrofasciatus* from material collected in the field, the author obtained a stable, partly melanistic mutant, which he calls *nigrescens* or *D. nigrescens*, sp.n.; its coloration and size are compared with those of *D. nigrofasciatus* and *D. melanoderes* in a table. A continuous series of forms intermediate between it and *D. nigrofasciatus* was bred. Forms described from Kilimanjaro by Schouteden as varieties of *D. nigrofasciatus* are placed between *D. nigrofasciatus* and *D. nigrescens*, and a form of *D. melanoderes* described by Distant is placed between *D. melanoderes* and *D. nigrofasciatus*. The bionomics of *D. nigrofasciatus* were studied in 1937 and those of *D. melanoderes* in 1940; the technique was that employed in similar investigations with *D. superstitiosus*. The results for *D. nigrofasciatus* are in general agreement with those obtained by other workers in Uganda and South Africa. The pre-mating period was shorter, and the total number of eggs and the number of egg-masses laid were rather less than in the case of *D. melanoderes*. At 25° C. (77° F.) and almost 100 per cent. relative humidity, 84·6 per cent. of the eggs of *D. nigrofasciatus* and 93·5 per cent. of those of *D. melanoderes* hatched. At 30° C. (86° F.) only 9·1 per cent. of the eggs of *D. nigrofasciatus* hatched at 100 per cent. humidity and none at 72 per cent. The egg

stage of this species at approximately 100 per cent. humidity lasted 5·2 days at 30° C. and 6·4 days at 25° C. Observations on the temperature at the surface of the bare soil at Bambesa in January, 1939, indicated that conditions there are not favourable for incubation, since the temperature exceeded 30° C. for at least five hours a day over more than half the month, and often exceeded the figure (108·6° F.) shown by Pearson to be fatal. At 25° C. and high humidity the development of *D. nigrofasciatus* was completed in 34 days and that of *D. melanoderes* in 36. The nymphal instars of both species are described. Observations on the longevity of adult males and females gave maximum periods of 164 and 160 days for *D. nigrofasciatus* and 205 and 301 days for *D. melanoderes*.

[*Cf.* Abstr. 167, Vol. XX. of this Review.]

455. CONTROL OF INTERNAL BOLL ROT OF THE COTTON PLANT CAUSED BY INSECT PUNCTURES (*Dysdercus* SP.), THROUGH SELECTION OF RESISTANT STRAINS. By T. Boza Barducci *et al.* (*Nature*, 25/8/45, p. 235.) One of the main problems related to cotton production in the irrigated valleys of the northern coastal area of Peru is connected with damage to the crop by the cotton stainer (*Dysdercus ruficollis* L.), which in some years causes a loss of many million soles (1 sol=1s. 1¾d. nominal value). The known methods of control for stainer damage, such as strict observance of time of planting and picking, destruction of host plants, trapping of insects, or control by insecticides such as " Babbini " (recently developed in the country), proved only partially successful. Following the interesting results obtained by Dr. Steyaert in the Belgian Congo, the authors submitted for the approval of the superintendent in February last " A project for phytotechnical investigations concerning the selection of Tanguis cotton strains resistant to the internal boll rot caused by the punctures of the 'arrebiatado' (*Dysdercus ruficollis*, L.) insect." After approval of the project the investigation started in April at the La Molina Agricultural Experiment Station. Isolations from internally diseased bolls and cultures were made from the following micro-organisms: *Y*-1=*Bacteria* sp. *Y*-2= a fungus not yet identified; *Y*-3=*Alternaria* sp.; *Y*-4=*Acremonium* sp. Of these, *Y*-3 and *Y*-4 micro-organisms seemed to be the most virulent. *Nematospora* spp. have not yet been found. A series of inoculation tests were then made on 160 plants selected from the best strains of the Plant Genetics Department. Four bolls from each plant were artificially infected in the laboratory, each one with a different micro-organism. For inoculation, the technique of Dr. Steyaert was followed with minor modifications, and proved very useful. Examination of artificially inoculated bolls after eight days showed a large percentage of their contents completely rotted, but twelve plants from four strains showed resistance to infection, especially the strain No. 16-38 (LM 7-35 group). Comparing the results obtained by Dr. Steyaert, who worked with American varieties of cotton (*G. hirsutum* L.) and those obtained by the authors, working with Peruvian varieties (*G. barbadense* L., var. *peruvianum*, Cav.) it may be assumed that the latter varieties are genetically more resistant to infection transmitted by the " arrebiatado " (*Dysdercus ruficollis* L.) insect. The investigation will be continued in the next cotton season.

[*Cf.* Abstr. 713, Vol. XVI. of this Review.]

456. DISTRIBUTION OF WHITE-FLY IN THE PUNJAB. By K. N. Trehan. (*Ind. Frmg.*, November, 1944, p. 514.) An extensive survey was carried out in the Punjab during 1934 and 1935, to study the distribution and relative incidence of *Bemisia gossypiperda* (white-fly) under different climatic conditions. All the district towns were visited during July and September in each year, and in order to have a general impression of the infestation, cotton fields at the Government experimental farms at each station and some belonging to the neighbouring cultivators were examined. Representative samples of top, middle, and bottom leaves were taken from the fields, and immature stages of white-fly were counted on them. The incidence of attack was worked out in relation to the leaf area examined. The information was further supplemented by data regarding the cotton varieties under cultivation, soil variations, crop rotation, nature of irrigation, temperature, humidity, rainfall, etc. . . . The investigations have shown that, besides the agricultural

practices, soil, and irrigation, climate is the most significant factor in controlling the distribution and spread of white-fly. Well distributed showers of rain during the active period of the pest form a considerable natural check on its multiplication, since the adults are killed and multiplication is thus decreased. The pest, as a rule, multiplies rapidly under high temperature and relatively low humidity. The results of the survey indicate that the attack of white-fly is highest in the central canal colony, where temperature is relatively high and rainfall scanty, which obviously lowers the humidity, and is lowest in the south-east and north-west Punjab, where rainfall and humidity are comparatively high, and the climate is rather temperate.

457. The Combating of Pests on other Insects by the Introduction of the Formicidæ. The Use of this Method in the Past, and the Possibilities of such a Method for Future Use. By B. D. W. Morley. (*Verh.* 7 *int. Kongr. Ent.*, **4**, Berlin, 1938, p. 2585. From *Rev. App. Ent.*, xxxiii., Ser. A, **4**, 1945, p. 122.) Contains lists of families, genera or species of ants that are predaceous on termites and on other insects, followed by notes of their habits. The difficulties of breeding colonies to introduce them against insect pests is pointed out, and suggestions are made regarding the methods of transporting ants and the factors to be considered in deciding whether a species is suitable for introduction into a particular country against a particular pest. The encouragement of indigenous species is recommended, and *Solenopsis geminata*, F., which destroys the cotton boll weevil (*Anthonomus grandis*, Boh.) in Texas, is cited as an example. In conclusion, an annotated list is given of ten species of ants that might be used against various pests, showing the countries in which they occur and into which they might be introduced, and the kinds of insects they attack.

458. Die Bekampfung der Heuschrecken mit *Empusa*. By P. Petrov. (*Verh.* 7, *int. Kongr. Ent.*, **4**, Berlin, 1938, p. 2616. From *Rev. App. Ent.*, xxxiii., Ser. A, **4**, 1945, p. 122.) *Empusa grylli* has caused high mortality of *Calliptamus italicus* L. during outbreaks of the latter in Bulgaria. Experiments showed that it spreads rapidly in examples of this locust kept in groups, and that healthy ones become infested if given food contaminated with the brown pulpy matter found in the hind part of the abdomen of locusts killed by it. Conditions favourable for its development were temperatures of 19-27° C. (66·2-80·6° F.) and a moderate atmospheric humidity; mass development in the field occurred only in summer. In field experiments in August at a temperature of 18·7-26·3° C. (about 66-81° F.) and a relative humidity of 41-81 per cent., spores of the fungus scattered on plants killed 83 per cent. of the locusts in six days.

459. The Effect of Population Density on the Productivity of the Parasite *Microbracon mellitor*, Say. By J. M. Carpenter. (*Proc. Tex. Acad. Sci.*, **27**, 1943. From *Rev. App. Ent.*, xxxiii., Ser. A, **3**, 1945, p. 70.) *Microbracon mellitor*, Say, a valuable parasite of *Anthonomus grandis*, Boh., in various cotton-growing areas of the United States, usually lays a single egg on the paralysed host larva. Single fertilized females kept for 72 hours in a volume of 420 c.c. at 85° F. with 20 larvæ on which to oviposit yielded an average of 7·5 adult offspring each. When batches of 5, 10, 15, 30, and 60 were kept under the same conditions, their individual productivity decreased to 2·85, 1·92, 1·47, 0·74 and 0·41 respectively. This decrease is believed to be due partly to competition among the parasites and partly to their laying fewer eggs because they have to spend a longer time in searching for unparasitised hosts.

460. Treat Cotton Seed. By S. G. Lehman. (*Res. and Frmg.*, **3**, 3, Raleigh, N.C., 1945.) Describes the method of dusting cotton seed heavily infected with spores of the anthracnose fungus with New Improved Ceresan.

461. Factors Influencing the Development of Cotton Diseases. By L. Ling. (*Ann. App. Biol.*, xxxi., **3**, 1944, p. 194. From *Rev. App. Mycol.*, xxiv., **3**, 1945, p. 100.) Cotton, mainly *Gossypium arboreum* and occasionally *G. hirsutum*, grown in the northern part of the Szechwan Province, China, is stated to suffer most commonly from bacterial blight (*Bacterium malvacearum*), anthracnose (*Glomerella gossypii*), soreshin (*Rhizoctonia solani*), alternaria (*Alternaria macrospora* and *A.*

tenuis), areolate mildew (*Mycosphaerella areola*), and boll rots (*Fusarium moniliforme*, *Diplodia gossypina*, and others). Extensive surveys were made during 1938-41 at ten-day intervals throughout the growing season in Suinin to investigate the relation of these diseases to climatic factors. A study of meteorological data (presented in averages or totals of periods of ten days to facilitate comparison between different years) revealed that under local conditions air humidity was more variable between the years than was air temperature or rainfall, and also that it had the greatest influence of the three on the development of nearly all the diseases except the soil-borne soreshin, which is more profoundly influenced by soil moisture and soil temperature. Generally, air humidity, when temperature was not extreme, determined to a large extent the reproduction and longevity of the inoculum, the initiation and intensity of infection, and the survival of the organism, temperature being apparently a subservient factor.

In 1938, relative humidity was low in May but became higher than in all other years from June to the time of picking; accordingly the seedling diseases were unimportant, while diseases of mature plants, including the boll rots, were serious. In 1939, high humidity early in the season encouraged the development of seedling diseases, while most diseases were greatly checked by low humidity later in the season. In the boll stage a very dry condition almost entirely eliminated the boll rots. During this and the preceding, but not the following, two years leaf infection by anthracnose was especially prevalent as a result of high humidity in June, doing little harm to Upland cotton but seriously damaging the Asiatic varieties by causing premature falling of leaves and even death of whole plants. In 1940, the humidity in May was the highest of the four years under review, and accordingly seedlings suffered from heavy anthracnose infection. Bacterial blight, on the other hand, was almost negligible. As both diseases are known to be carried over the winter mainly by seed and had been very scarce on cotton bolls in the previous year, it is concluded that the abundance of anthracnose on seedlings points to another mode of survival, probably as a saprophyte. *Alternaria* leafspot was also highly destructive of seedlings. Unusually dry weather in July, 1940, checked the development of leaf and stem diseases such as bacterial blight, *Alternaria* leafspot, and anthracnose, but a gradual increase in humidity in late August and September brought about a high incidence of bacterial blight and a severe outbreak of boll rots. In 1941, the humidity was low before the middle of July but rose later, resulting in a gradual increase of bacterial blight late in the season and an outbreak of various boll rots, *Alternaria* leafspot also appearing later than usual. Soreshin was generally greatly reduced by prolonged dry periods before and after sowing, as in 1938 and 1941. Ordinarily, the disease appeared in May soon after the emergence of seedlings and was checked by the rise of temperature later in the season. In 1940, however, the unusually low soil temperature in May permitted the occurrence of a high percentage of infection as late as early June.

Variation in the time of sowing was found to influence the incidence of diseases of both seedlings and mature cotton plants. In the latter, late sowings appeared to reduce the intensity of bacterial blight and anthracnose. Of the cultural practices tested, nitrogenous fertilizers generally increased the incidence of most diseases; denser stand and closer spacing brought about a heavier infection in stem and leaf but not in boll diseases; and a mixed cropping system had no effect on the fungal and bacterial diseases.

462. FABRIC DETERIORATION BY THIRTEEN DESCRIBED AND THREE NEW SPECIES OF *Chætomium*. By G. A. Greathouse and L. M. Ames. (*Text. Res. Jour.*, June, 1945, p. 223.) The loss of military material, mainly cotton fabrics, and other cellulosic substances, in tropical and sub-tropical areas has directed renewed attention to and stimulated studies concerning cellulose-decomposing organisms, among which species of the genus *Chætomium* are conspicuous. Evidence is presented in this paper which establishes the comparative abilities under similar experimental conditions of sixteen species of *Chætomium* to decompose cotton fabric. Drawings of most of the species are included. Approximately one-half of the known species of *Chætomium* are included in this study.

463. Mildew- and Rot-Resistance Tests: Co-operative Study. Amer. Assen. of Textile Chemists and Colorists Sub-Committee on Mildew Proofing. See Abs. 536.

464. Fungus Slide Cultures: New Methods. By M. B. Morrow and M. G. Rachaner. (*Trans. Tex. Acad. Sci.*, *1943*, xxvii., p. 114. From *Rev. App. Mycol.*, xxiv., **3**, 1945, p. 110.) Distinctive features of the slide culture technique for mould study developed at the Dept. of Botany and Bacteriology, University of Texas, include the dispersal of the inoculum in 1 per cent. glycerine water; the spreading of the medium (Waksman's agar) in a ribbon-like streak or so as to form a roughly circular area several mm. in diameter; the incubation of the prepared slide, placed agar side upwards crosswise over another slide in a "moist chamber" consisting of a Petri dish with a few drops of sterile water in the bottom; and the use of lactophenol as a combined fixing-staining-mounting medium. Some growth should become apparent after 24 hours, but the development of fructifications may require a period of up to 72 hours, or even a week in the exceptional case of *Chætomium*.

465. Cotton Extract: Effect on Germination of *Phycomyces* Spores. By W. J. Robbins and M. B. Schmitt. (*Bull. Torrey Botan. Club*, **72**, 1945, p. 76. From *Summ. Curr. Lit.*, xxv., **12**, 1945, p. 286.) Extracts which favourably affected the germination of spores of *Phycomyces blakesleeanus* were obtained by autoclaving cotton-plugged tubes. The active material was distilled from cotton plugs by dry steam. It was not removed by heating moist or dry cotton at 100° C. It was thermostable and could be concentrated in aqueous solution by evaporation. It disappeared on drying an active solution at 50° or 100° unless the solution was neutralised. It is believed to be an organic acid adsorbed by the cotton and freed by dry steam.

466. Red Leaf in *Gossypium hirsutum* Cotton. By K. Ramiah and B. Nath. (*Proc. 31st. Ind. Sci. Congr.*, Delhi, 1944, Pt. III, p. 163. From *Pl. Bre. Abs.*, xv., **2**, 1945, p. 107.) The red colour in the leaves of *Gossypium hirsutum* may occur uniformly over the whole of the upper surface, in which case it behaves as a Mendelian character; or in patches on both the leaf surfaces associated with a curling or crumpling of the leaf, the latter condition considered to be a result of jassid attack. It is stated that the former effect may be a desirable character as it causes extra earliness in the plant.

467. Studies on the Root Rot Disease of Cotton in the Punjab. XIII. Leaf Temperatures of Healthy and Root-Rot Infected Plants. By R. S. Vasudeva. (*Ind. J. Agr. Sci.*, December, 1944, p. 385.) The results of experiments showed that diseased plants remained considerably warmer than the healthy plants. To indicate the statistical significance of the differences in temperature recorded, a function t was calculated from the data as described by Fisher. For a series of six observations the value of t 2·57 was just on the margin of significance (the usual 20 : 1 standard being adopted). The temperature differences both of the upper surface and the inner tissue of diseased and healthy leaves were found to be significant. The inner tissue temperature showed a constantly lower value than the surface temperature, and this held good in the healthy as well as in the diseased plants. Preliminary experiments conducted to determine the rate of transpiration of healthy and root-rot infected cotton plants showed the rate of transpiration to be considerably higher in healthy plants.

[*Cf.* Abstr. 433, Vol. XXI. of this Review.)

468. Studies on the Root-Rot of Cotton in Sind. II. Relation of Root-Rot of Cotton with Root-Rot of other Crops. By N. Prasad. (*Ind. J. Agr. Sci.*, December, 1944, p. 388.) Isolations carried out from the rot-infected roots of cotton, castor, sunnhemp, *guar*, and *til* yielded cultures of *Rhizoctonia* and *Fusarium*. Both of these fungi were found to be parasitic, and further isolates of each of them from different crops were found to be morphologically and pathologically similar. They were identified as *Rhizoctonia bataticola* (Taub.) Butl., and *Fusarium cœruleum* (Lib.) Sacc.

[*Cf.* Abstr. 181, Vol. XXII. of this Review.]

469. Synthetic Culture Media for the Root-Rot Fungus *Phymatotrichum omnivorum*. By W. N. Ezekiel. (*Phytopathology*, xxxv., 3, 1945, p. 159. From *Rev. App. Mycol.*, xxiv., 7, 1945, p. 275.) For convenient reference, and to avoid the necessity for continuous re-description of the synthetic media in common use for the culture of the cotton root-rot fungus, *Phymatotrichum omnivorum*, five important formulæ (three liquid and two solid) are presented.

470. Hubam Clover Greatly Reduces the Early Attack of Root-Rot in the Black-Lands of Texas and Increases the Yield of Cotton. By J. O. Hill and P. B. Dunkle. See Abstr. 388.

471. Relation of Soil Micro-Organisms to the Severity of Root-Rot of Cotton in Texas. By F. M. Eaton and N. E. Rigler. (*55th and 56th Ann. Rpts.*, 1942 and 1943. Received 1945.) New evidence has been developed that saprophytic soil and root surface micro-organisms play an important part in lessening the seriousness of the root-rot disease. Heavily fruited cotton plants are more susceptible to root-rot than are plants from which the bolls have been removed. The removal of bolls results in increased sugar concentrations in the roots and in turn in marked changes in the numbers of bacteria supported on the root surfaces. The acidity of certain Texas soils encourages the growth of micro-organisms that are destructive to the root-rot fungus. Root rot makes poor growth on acid Wilson soil as found in the field, but following either the addition of calcium carbonate to neutralize the acidity, and thereby alter the microflora, or following steam sterilization, which does not greatly change the acidity but does destroy other organisms, the fungus makes a rapid growth. The addition of manures and crop residues to soils encourages the growth of antibiotic organisms and lessens the severity of root rot.

472. Keimlingskrankheiten der Baumwolle in Sudwest-Anatolien. By H. Bremer. (*Istanbul. Schr.*, 4, 1943. From *Rev. App. Mycol.*, xxiv., 6, 1945, p. 229.) Following up Forsteneichner's studies on cotton seedling diseases in the Adana region of Turkey in 1929, the writer extended similar investigations to eleven other centres of cultivation in different parts of western Anatolia. From preliminary data it appeared very probable that parasitic agents do not play a decisive part in the development of cotton seedling diseases, which are primarily due to weakness incidental to adverse environmental conditions. In a series of experiments designed to verify this hypothesis, Bornova seed was sown in tin flats on six dates from January to July in 1939 at mean temperatures of 16°, 17°, 19°, 22°, 24° and 32° C., respectively. Half the flats were sterilized with formalin, filled with sterilized soil, and watered with boiled water, and half the seed was dusted with ceresan (400 gm. per 100 kg.); in half the containers the soil was maintained in a moderately moist condition (50 per cent. of the water-holding capacity), and in the remainder in an extremely humid state (75 or up to 80 per cent.). Except at the minimum and approaching the maximum temperature, seed treatment with ceresan noticeably increased germination, especially in unsterilized soil: in the former case the deleterious effects of cold were too powerful to be counteracted by the precaution, and in the latter the already high germinative capacity of the seed rendered further treatment superfluous. In sterilized soil the increase in germination was already apparent at 19°, whereas in untreated no comparable effect was observed until a temperature of 24° was reached. Evidently, dusting with ceresan not only eliminates the organisms actually adhering to the seed, but also acts as a local soil disinfectant. In connexion with these tests, it is worthy of note that ceresan treatment somewhat retarded cotyledonary development; there were however, no permanent ill effects. Further support was lent to the view that the fungal infection of cotton is secondary to injury of physiological origin by the microscopic detection of a diffuse brown discoloration, extending from the hypocotyl-root borderline more or less all over the underground system and obviously of external origin, since the inner layers were sound until saprophytic or facultative parasites gained ingress through the damaged tissues. Predominant among the invaders were *Rhizoctonia* sp. and bacteria, of which the former was usually associated with sharply delineated, sunken, constricted lesions and the latter with generalized decay. In most cases, however,

both agents were present and the symptom-complexes frequently overlapped. *Rhizopus*, *Fusarium*, and *Alternaria* spp. were of less frequent occurrence and presumably of minor importance in the etiology of seedling rots. In greenhouse and field seed treatment trials in 1938 and 1939 the relative values of ceresan solution and dust, Gassner's copper sulphate-ammonia solution, delinting with concentrated sulphuric acid, and dusting with caustic lime were compared. Ceresan gave the best results in the field, but it failed to counteract the damage inflicted by a dry spell in 1939, and even in plots where germination was powerfully stimulated the treatment did not prove to be economically advantageous.

[*Cf.* Abstr. 394, Vol. IX. of this Review.]

473. "SMALL LEAF" DISEASE OF COTTON. By B. N. Uppal *et al.* (*Curr. Sci.*, xiii., **11**, 1944, p. 284. From *Rev. App. Mycol.*, xxiv., **3**, 1945, p. 100.) "Small leaf" or stenosis of cotton is prevalent in the Provinces of Bombay, Madras, and the Punjab, and experiments were carried out at Anand, North Gujerat, and at Poona, to determine the possibility of its transmission by grafting. Rozi (*Gossypium arboreum*, var. *typicum* f. *indica*), a highly susceptible perennial variety widely cultivated in the Kaira district of Bombay, was used as the stock, the top being cut off and the stem split down the middle for about an inch to permit the insertion of scions from diseased plants. Some of the tests were successful (number unspecified), as indicated by the typical symptoms of stenosis in the new growth arising from the axillary buds on the previously healthy stocks. Other experiments on American, Jarilla, Gaorani, and Mungari stocks likewise gave positive results. These data are considered to establish the agent of the disease as a graft-transmissible virus, which is apparently not communicable through the sap or seed.

474. STUDIES IN THE PERIODIC PARTIAL FAILURES OF THE PUNJAB-AMERICAN COTTONS IN THE PUNJAB. XII. FURTHER EXPERIMENTS ON THE AMELIORATION OF *Tirak*. By R. H. Dastur *et al.* (*Ind. J. Agr. Sci.*, June, 1944, p. 181.) Summarises the results of numerous multi-factor experiments in relation to *tirak* disease of cotton conducted in the different cotton-growing tracts of the Punjab over a number of years with the commonly-cultivated varieties. Applications of nitrogen and extra water are specific remedies. Extra water at the fruiting stage ameliorates *tirak* and gives higher yields of *kapas* on soils with saline subsoil, where nitrogen application is totally ineffective. Application of nitrogen is highly successful in reducing *tirak* and raising yields on light sandy non-saline soils, where the response to heavy watering is meagre. On soils which are not only sandy and deficient in nitrogen but are also saline or alkaline in the subsoil, the application of nitrogen does not improve opening of bolls even though it raises the yield through more profuse bearing. June sowing is a common ameliorative measure irrespective of the *tirak*-promoting soil conditions. The commonly-cultivated American cottons are prone to *tirak* when sown in May, but they improve in opening when sown in June. The yield results are also favourable, provided the necessity of close spacing for late sowing is correctly appreciated. As it is extremely difficult for a zemindar to distinguish the soil conditions causing *tirak*, the adoption of late sowing as a general measure is of great practical value. Two schedules have been prepared for the guidance of the cultivators on the basis of experimental results. Schedule A indicates the changing seed rate and spacing with advancing dates of sowing. Schedule B furnishes particulars as to the optimum sowing periods for the commonly-cultivated varieties in each district.

[*Cf.* Abstr. 234, Vol. XXII. of this Review.]

475. PLANT VIRUSES. By K. M. Smith. (*Endeavour*, **4**, 13, London, 1945, p. 22. From *Exp. Sta. Rec.*, **93**, 1, 1945, p. 43.) A brief semi-popular review of the present status of knowledge on the viruses of plant diseases, including some of the symptoms, immunity relations of virus strains, the size and shape of plant viruses, their transmission, and some unusual viruses. Ten of the illustrations are in colour.

[*Cf.* Abstrs. by same author in Vols. XI. to XIX. of this Review.]

GENERAL BOTANY, BREEDING, ETC.

476. PROGRESS REPORTS FROM EXPERIMENT STATIONS, 1943-44. (Pubd. by the Empire Cotton Growing Corporation, 1945. Price 3s., post free.) Progress reports are included summarizing the work carried out during the 1943-44 season at the Cotton Experiment Stations in Queensland, South Africa, Swaziland, Southern Rhodesia, Sudan, Tanganyika Territory, Nyasaland, and the West Indies. The reports on the work in the Northern and Southern Provinces, Nigeria, and at the Kawanda and Serere Stations in Uganda are included by courtesy of the Nigerian and Uganda Governments. Good progress was maintained in South Africa in the breeding work with U.4 and its derivatives. Useful work was continued at the Stations in connection with cotton genetics and breeding, varietal trials, fertilizer experiments, rotation of crops, and in research on cotton pests and diseases. Programmes of experiments for the 1944-45 season are included. The reports should prove of much interest and value to those concerned with the cultivation of cotton and similar crops.

477. GENETICS ON NEW PRINCIPLES. By B. Keller. (*Proc. Lenin Acad. Agr. Sci.* U.S.S.R., **10,** 1944, p. 3. From *Pl. Bre. Abs.*, xv., **3,** 1945, p. 214.) An extensive review is given of Lysenko's recent work entitled "Inheritance and its Changeability" with many original observations of the reviewer. For instance, it is stated that certain solonchak soils contain so much soluble sodium chloride, sodium sulphate and other salts that most plants will not grow in them. Certain species were found, however, which at first would just tolerate these soils and later came to be intolerant of any other. There is little doubt that in the evolution of these salt-tolerant plants a change was effected in their type of assimilation and metabolism; this produced a very original type of vital processes and an accompanying change in the morphological properties of the plant concerned.

[*Cf.* Abstr. 196, Vol. XXI. of this Review.]

478. WAYS OF STABILIZATION OF GENOTYPE. I. SELECTION OF STABLE ALLELOMORPHS. By M. V. Ignatiev and N. I. Shapiro. (*C.R.* (*Doklady*) *Acad. Sci. U.S.S.R.*, **45,** 1944, p. 206. From *Pl. Bre. Abs.*, xv., **3,** 1945, p. 214.) The selection of stable genotypes may proceed along two lines simultaneously, (1) by selection of stable alleles, and (2) selection of genes modifying mutability. The authors present a summary of a biometric analysis of the possibility of the ways of selection of the most stable alleles in a given population.

479. ALLOWANCE FOR DOUBLE REDUCTION IN THE CALCULATION OF GENOTYPE FREQUENCIES WITH POLYSOMIC INHERITANCE. By R. A. Fisher. (*Ann. Eugen*, **12,** 1944, p. 169. From *Pl. Bre. Abs.*, xv., **2,** 1945, p. 100.) An algebraic treatment is presented of the problem of determining genotype when double reduction is not negligible, with special reference to tristylic species.

480. GENETIC DIVERSITY OF GAMETES IN THE FLOWER OF THE COTTON PLANT. By D. V. Ter-Avanesjan. (*C. R.* (*Doklady*) *Acad. Sci. U.S.S.R.*, **44,** 1944, p. 345. From *Pl. Bre. Abs.*, xv., **3,** 1945, p. 254.) The effects of pollination by a limited number of pollen grains were observed, in order to study the qualitative character of the male gametes. Up to 20 pollen grains were transferred to a stigma; the number of seeds formed was found to vary between 8 and 15 per boll. The varieties used were C-15 (Upland) and 35-1 (Egyptian). The F_1 plants so obtained consisted of plants inferior in all characters to the controls, and others excelling the control plants. No segregation was observed in the F_2. The author ascribes the nature of the F_1 population to the qualitative heterogeneity of the male gametes of a single flower, and the lack of segregation in the F_2 to the effect of intrafloral hybridization. He is of the opinion that the so-called method of limited pollination may be applied in practical breeding to improve a variety or to obtain a new variety from an existing variety in a short time.

481. GENE SEGREGATION IN AUTOTETRAPLOIDS. By T. M. Little. (*Bot. Rev.*, xi., **1,** 1945, p. 60. From *Exp. Sta. Rec.*, **92,** 5, 1945, p. 635.) In summarizing this comprehensive review (84 references), the author states that three main theories of

autotetraploid segregation have been propounded, viz., the Muller hypothesis based on the random assortment of chromosomes at meiosis, that of Haldane based on the random assortment of chromatids, and that of Mather in which the ratios are considered as not fixed but varying according to the amount of quadrivalent formation and the distance of a gene from the centromere. The last is believed most satisfactory in explaining observed data. Though many autotetraploids do not lend themselves readily to genetic analysis, due to sterility, chromosome differentiation, or lack of good genetic characters, fairly extensive studies have been carried out on the autotetraploid genetics of 10 species of genera. The cytological variables affecting autotetraploid segregation are mode of pairing, formation of quadrivalents, and number and position of chiasmata. In progenies unaffected by other variables it is possible to gain an estimate of the position of the gene involved with respect to the centromere. Differential viability markedly affects some of the autotetraploid ratios and can account for some of the discrepancies between observed data and expectancies. Incomplete dominance is more common among tetraploids than among diploids, due to the greater number of genotypes possible for any given pair of factors. Because of striking differences between the genetics of diploids and tetraploids, plant breeding procedures applicable to diploids must frequently be modified in dealing therewith.

482. O Problema da Delimitação e Origem das Especies do Ponto de Vista da Biologia Experimental. By A. Quintanilha. (*Bol. Soc. Brot.*, **17**, 1943, p. 159. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 214.) The way in which systematics has gradually changed from a purely descriptive to an experimental science is discussed, the importance of the contributions made by genetics, cytology and interfertility studies being emphasized. In the Hymenomycetes considerations of interfertility have almost invariably coincided with the purely morphological criteria in considering the validity of species, but have in certain difficult cases helped considerably towards a clarification of the situation.

483. The Rise of the Cell Theory. By L. P. Breslavec. (*J. Gen. Biol.*, **5**, 1944, p. 96. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 214.) This is an up-to-date review on the subject. The author traces back the first descriptions of the cellular structure of plants to Hooke, Malpighi and Grew at the end of the seventeenth century. The accumulation of knowledge proceeded parallel with the improvement in the construction of the microscope and of microscopic technique. Discussing in some detail the work of English, French, German, and Russian authors of the eighteenth and nineteenth centuries, before and after the appearance of the treatises of Schwann and Schleiden, the author stresses the point that neither of the latter investigators can be recognized as a founder and originator of the cell theory. They merely summarized the contemporary knowledge and popularized the already existing theory. In subsequent years a large body of investigators claimed to prove the erroneousness of many of the views advanced by Schwann and Schleiden in their books; and the cell theory, as we know it to-day, is the result of collective effort by many generations of scientists.

484. Cytogenetics and Improvement of Cotton. By T. R. Richmond *et al.* (*55th and 56th Ann. Rpts.*, Texas Agr. Exp. Sta., 1942 and 1943, p. 39.) The adaptation to cotton of the colchicine technique, whereby heretofore difficult or impossible hybrid combinations can be made and fertility can be induced in otherwise sterile hybrids, has opened up a new field in cotton genetics and breeding. Using methods involving this technique, a genetic study of the taxonomic relationships of cotton species is well on its way to completion. Studies of plants with more than the basic number of chromosomes afford a direct method of determining the effects on American Upland cotton of chromosome balance and the effects of genes introduced from wild or distantly related species. Four plants with an extra pair of chromosomes (26×11) were recovered in 1943. This, so far as is known, is the first occurrence of this phenomenon in cotton. Since fertile hybrids between cultivated American 26-chromosome cottons and wild or cultivated 13-chromosome cottons can be made almost at will, it is now possible to utilize a vast number of economic characters

carried in the latter types. One of these characters, fibre strength, is of particular importance at present; and while average Upland cotton gives a breaking strength of approximately 80,000 lb. per square inch, productive lines which break at 100,000 to 119,000 lb. per square inch have been recovered from species hybrids.

485. Comments on Chromosome Structure. By I. Manton. (*Nature*, 21/4/45, p. 471.) Professor Schroedinger's suggestions as to the nature of the gene, given in his book "What is Life ?" are examined by the writer in the light of recent cytological research on chromosome structure.

486. Chromosomenstruktur. By J. Straub. (*Naturwissenschaften*, **31**, 1943, p. 97. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 216.) A general review of recent work on chromosome morphology is presented. After observations on the gross structure of the chromosomes, the author turns to questions of fine structure. The importance of correlating genetical and cytological studies in the field is emphasized, also the importance of studying the salivary chromosomes of the Diptera. A short discussion follows on the significance of the heterochromatic regions and the nucleolus as regards the protein metabolism of the cell. Final sections deal with the biochemistry of nucleoproteins, the nucleic acid cycle, the autoreproduction of bodies containing nucleic acids and the fine structure of the cytoplasm.

487. Mitosis. The Movements of Chromosomes in Cell Division. By F. Schrader. (Columbia Univ. Press, N.Y., 1944, $2. From *Pl. Bre. Abs.*, xv., **2**, 1945, p. 180.) Based mainly on the results of direct observation, Professor Schrader's monograph gives a detailed account of the structures to be observed in cells undergoing mitosis and then summarizes adequately and critically, though briefly, the different hypotheses which have from time to time been advanced to explain the movements of chromosomes at mitosis. The general approach is analytical rather than synthetical and some readers, especially on this side of the Atlantic, may complain that the author has paid too little attention to the comparative or, as it is sometimes called, "experimental" method. There is no doubt, however, that the book serves a very useful purpose in bringing together observations gathered over a very wide field and subjecting them to the scrutiny of an experienced cytologist. The diversity of the forces to which appeal has been made to account for chromosome movements is very striking, and one can sympathize with the author who refrains at the present stage from attempting a synthesis.

488. Die Mechanik der Mitose. By L. Geitler. (*Naturwissenschaften*, **31**, 1943, p. 501. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 217.) The various stages in normal mitosis are described and considered in relation to possible explanatory theories. It is believed that the movement of the chromosomes must be interpreted as a resultant of attractive and repelling forces operating between the chromosomes themselves and between them and the spindle poles. The importance of the centromere as the actively motile locus of the chromosome and as the region at which the anaphase separation of the chromatids begins is emphasized. Cell division and chromosome division should be envisaged as related but independent processes as is shown in c-mitosis where chromosomal fission is unaccompanied by cell division. The significance of the spindle in relation to these processes is discussed.

[*Cf.* Abstr. 449, Vol. XXI. of this Review.]

489. Evolution and Domestication of Cotton. By J. B. Hutchinson, R. A. Silow, and S. G. Stephens. (*Genetics*, **30**, 1, 1945, p. 9, Abstract.) Genetical and cytological studies in *Gossypium* are sufficiently advanced to justify the preparation of a classification of the genus which, while being soundly based on data derived from them, will be acceptable to the taxonomist as a reasonable and natural account of the species related to, and including, the cultivated cottons. The diploid species fall into three major groups between which chromosome homology is low. Members related to two of these groups, one confined to the Old World and the other to the New, have entered into the ancestry of the amphidiploid American cottons. Within main cytological groups progressive differentiation accompanying geographic divergence has led to the establishment of populations characterized by co-ordinated genetic systems harmoniously integrated to give a balanced genotype, but so different

in gene content as to give rise to extensive polygenic segregation in crosses between them. Recombination products are less balanced than the parental forms, many being weak or partially sterile. Natural selection ensures their elimination. Populations whose integrity is maintained by such a genetic barrier are accorded specific rank. Just as their separation differs only in degree and not in kind from that between varieties, so also their distinction differs only in degree from that which exists between species which give highly sterile F_1 hybrids. In the hairs which occur on the seeds of wild diploid species, both Old World and American, secondary deposition of cellulose in spiral pattern on the inner surface of the wall proceeds until the central lumen is almost completely obliterated. Domestication, which occurred in the Old World, was dependent upon a reduction in amount of secondary thickening, so that, on drying, the hairs collapsed into flat convoluted ribbons which can be spun. It is reasonable to suppose that the New World amphidiploids acquired their lint from their Old World ancestor. The extensive cultivation of cotton, and its comparatively recent spread into areas subject to frost, has followed the development of the annual habit. This has occurred independently in all four cultivated species.

490. Effects of Early Topping on Ratooned American-Egyptian Cotton. By R. H. Peebles. (*J. Amer. Soc. Agron.*, **37**, 2, 1945, p. 90. From *Exp. Sta. Rec.*, **93**, 3, 1945, p. 277.) To determine whether distinguishing characteristics of ratooned American-Egyptian cotton are inherent or due to the earliness of its reproductive period, alternate sections in a plot of the Amsak variety were topped one week after the first flower appeared, causing an initial delay of five weeks. In comparison with untreated cotton, the topped definitely resembled annual cotton in yield, lint percentage, lint index, staple length, seed fuzziness, seed index, and fibre fineness, although its fibre was stronger. Seasonal climatic factors apparently involved were drying atmospheric conditions and length of day, both reaching their maxima in June, the month during which ratooned cotton flowers most freely in southern Arizona. The mere fact that ratooned cotton develops new aerial parts from a fully developed root system did not in itself seem to have important effects on the seed cotton and fibre characters.

491. A Melhor Fibra de Algodão Produzida no Brasil. (*Bol. Minist. Agr. Rio de J.*, **32**, 9, 1945, p. 144. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 254.) Reference is made to the cotton breeding work carried out at Pendência in the State of Paraná. The cotton Mocó Paraiba (M×P) has the best and longest lint of any yet found, many plants having fibres of over 50 mm., which are exceptionally silky and practically white in colour.

492. China. A Review of Cotton Research. By C. L. Hu. (*Chinese J. Sci. Agr.*, **1**, 1943, p. 147. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 252.) This paper gives a brief survey of researches on cotton in China during the last 25 years. It covers studies on (1) geographic distribution, (2) soil and fertilizers, (3) classification of cultivated varieties, (4) adaptability of Chinese and American varieties, (5) breeding, (6) genetics, (7) cultivation practices, (8) physiology, (9) quality of fibre, (10) diseases and pests, (11) farming implements, and (12) standardization of commercial fibre grading. There are altogether five species known to be in cultivation: *Gossypium arboreum* L., of which the variety Nanking, sub-divisible into some 40 morphological types, annual and perennial, is most widely distributed; *G. herbaceum* L., which is confined to Sinkiang and Kansu; *G. hirsutum* L., which has been introduced from America and is common in North China; *G. barbadense* L., comprising *G. lapideum* Jussac., and *G. peruvianum* Cav., both of south-west China, and *G. purpurascens* Poir, which is cultivated in Kwangtung and Kwangsi.

Introduction of American varieties began in 1911 and the first adaptation study was conducted in 1918-19 followed later by acclimatization work. A second large-scale adaptation trial was made in 1933-37 with 31 newly-introduced varieties. It was found that Stoneville No. 4 was best for the Huang-ho delta and Delfos No. 531 for the Yang-tze delta. Since the war further trials have been made in the south-western provinces. Many local and imported varieties have been tested and the best

ones determined for each locality. Many American varieties are cultivated in China with success. In general the early-ripening varieties are suitable but the "big-bolled" varieties are not. The indigenous varieties are less adaptable; they generally do best in the particular localities in which they are found. The imported varieties are most important in the Huang-ho delta but not in the Yang-tze delta where local varieties are mainly grown because of the more varied natural and farming conditions. In the south-west, the cultivation of *G. barbadense*, Egyptian and Sea Island, is more promising. Breeding work consists of the acclimatization of the imported varieties, pure line selection of local varieties, and hybridization. Pure line selection since 1921 on both quality and yield has resulted in many improved varieties. The most important are: Improved Blue-stem Arboreum, Improved Small White Flower, Improved Kiangyin White Seed, Shaogan Smooth-seed Long-staple, Pei-wan Chinese, Funghsien American No. 72, and Chungmung New Delfos. Hybridization experiments have been made with Chinese, American and Indian varieties. More success was obtained using the American varieties as female parent. Hybrid vigour was very marked but fertility was generally low. Important varieties obtained from hybridization are: Kwu's cotton (Kiangyin White Seed × Peking Long-staple), Changfeng (Pei-wan × Shaogan Long-staple); Multi-valve Ta-seh (Kiangyin White Seed × Five-valve Arboreum); Resistant Long-staple (Indian Arboreum × Shaogan Long-staple); and Arboreum-Delfos (American Arboreum × Delfos No. 531).

Interesting discoveries have been made in the genetic studies. A yellow seedling mutant has been found and proved to be a simple Mendelian recessive lethal, linked with anthocyanin pigmentation. Another chlorophyll-deficient, yellow-green mutant has also been shown to be a simple Mendelian recessive. Hutchinson's allelomorphic series of anthocyanin pigments has been revised, and a new parallel series of allelomorphs has been discovered. A new leaf-roll mutant has been shown to be a simple recessive and is linked with leaf-form with a cross-over value of 16·6 per cent. Simple Mendelian inheritance has also been shown for leaf nectar-glands, corolla coloration, and corolla base coloration. Statistical studies have been made on the quantitative inheritance of the number of valves, weight of fruit, and yield.

493. The Science of Plant Breeding. By D. Lewis. (*Nature*, 24/3/45, p. 355.) An account of the work carried out in Peru by Dr. Harland on the improvement of Tanguis cotton. The objectives of the work, nine in number, included improvement in such characters as yield, fibre-length, colour, and disease resistance. For the purpose of maintaining a certain degree of diversity from which further selection would be possible, and also for obtaining effective results quickly, pure line breeding was abandoned in favour of mixed strain selection, the final product combining a genetical diversity with superior quality.

[*Cf.* Abstr. 508 of this number.]

494. Progress of Botany with Special Reference to Economic Plants. By T. S. Sabnis. (*Proc. 31st Ind. Sci. Congr.*, Delhi, 1944, Pt. II., p. 60. From *Pl. Bre. Abs.*, xv., **2**, 1945, p. 98.) Work done in India and abroad is reviewed under the following heads: plant breeding and genetics, plant geography, plant ecology, photoperiodism, vernalization, growth hormones, rôle of secondary elements, hydroponics, and plant diseases.

495. Lectures on the Inorganic Nutrient of Plants. By D. R. Hoagland. (Pubd. Chronica Botanica Co., Waltham, Mass., U.S.A., 1944. Price: $4. London, Wm. Dawson and Sons Ltd. From *Trop. Agr.*, March, 1945, p. 50.) This book comprises a series of seven lectures given by the Professor of Plant Nutrition of the University of California, who has been investigating for many years the processes of nutrient absorption and translocation and of nutrient uptake from the soil. The lectures emphasise the part which the Californian School of Plant Physiology has played in the elucidation of these problems; they do not pretend to cover the subject exhaustively but rather to provide a survey of some important aspects, and in that sense the book can strongly be recommended to students of plant physiology, crop ecology, and the principles of agriculture.

496. GROWTH STATUS OF THE COTTON PLANT AS INFLUENCED BY THE SUPPLY OF NITROGEN. By C. H. Wadleigh. (*Arkansas Sta. Bull.* 446, 1944, p. 138. From *Exp. Sta. Rec.*, **92**, 4, 1945, p. 503.) Rowden 2088 cotton plants were grown in sand culture at 8, 25, 75, and 225 p.p.m. levels of nitrogen supply, all as nitrates, respectively. Some of the plants were harvested at incipient florescence and others 40 days afterwards, and the rest were allowed to mature a crop of bolls. Observations were made on growth, green weight of plants, amount of nitrogen absorbed, nitrogenous components of various parts of the plants, carbohydrate and starch accumulation in leaves and stems. Plants maturing a crop of bolls averaged 27·0, 57·3, 119·8, and 143·0 gm. of seed cotton per plant, respectively. Fruiting charts revealed that, after a plant had set bolls enough to deplete its nitrogenous reserves, abscission occurred of all young bolls subsequently formed, and soon after, of young squares, and terminal buds of the fruiting branches aborted. Boll size, average weight of individual seeds, and length of lint tended to rise slightly with increase in level of nitrogen nutrition, while lint percentage tended to decrease. Protein content of seeds increased markedly with treatments conducive to increasing nitrogenous reserves within the plant. Oil content of seeds decreased with a lowering in carbohydrate reserves as conditioned by nitrogen nutrition. The trend for gossypol content was similar to that for oil. It is considered to be economically advantageous to maintain cotton at a high level of nitrogen metabolism prior to the fruiting period.

497. COTTON PLANT: ABSORPTION OF SALTS FROM SOLUTIONS. By P. A. Henckel *et al.* (*C. r. Acad. Sci.*, **42**, U.S.S.R., 1944, p. 33. From *J. Text. Inst.*, July, 1945, A285.) Following seed treatment with van't Hoff's salt solution, cotton plants (compared with untreated controls) absorbed less chloride and sulphate from 0·2N salt solution. When phosphate and chloride were supplied in low concentrations they were absorbed at least as well by treated as by untreated plants. The treatment protected the plant against the toxic effects of high salt concentration in the medium.

498. TEMPERATURE-GROWTH RELATIONS OF THE ROOTS AND HYPOCOTYLS OF COTTON SEEDLINGS. By C. H. Arndt. (*Pl. Physiol.*, **20**, 2, April, 1945, p. 200.) The results of this study indicate three striking features of temperature relations that seem not to have been recorded hitherto for seedlings of any species.

(1) The temperature optimum for elongation of both the primary roots and the hypocotyls shifted with time and growth. For elongation of the primary roots, the shift was downward from 33°-36° at the start, to about 27° after three to four days of growth; for elongation of hypocotyls the shift was in the opposite direction, but was not as great, being from about 33° at the start to about 36° after about four to five days of growth.

(2) Although the optimal temperatures for elongation of the primary roots and of the hypocotyls were nearly the same (about 33°) for a short time after germination began, they differed by as much as 9° when the primary roots had extended downward about 100 mm. and the hypocotyls had extended upward about 160 mm., or when the two main regions of growth were about 26 cm. apart. If this observation should be found to apply to cotton seedlings in the field, it would indicate that young cotton plants may be remarkably well adapted to the temperature differences between air and various depths of soil by virtue of well-timed shifts in the temperature optima for elongation of primary roots and of tops.

(3) According to several criteria, the temperature of 30° was favourable for increase in weight and for the development of cotyledons and secondary roots, but proved relatively less favourable for the most rapid elongation of the hypocotyls and primary roots of these cotton seedlings when they were about a week old. This characteristic may represent some important physiological feature worthy of special study.

499. SUGAR MOVEMENT TO ROOTS, MINERAL UPTAKE, AND THE GROWTH CYCLE OF THE COTTON PLANT. By F. M. Eaton and H. E. Joham. (*Pl. Phys.*, **19**, 1944, p. 507. From *Circ. No.* 107, Texas Agr. Exp. Sta., 1944, p. 49.) The effect of fruiting upon the sugar concentrations in the fibrous roots, and in turn upon bromine uptake, was studied by comparing fruited and defruited plants grown in sand cultures. By the end of a period of three weeks, following the addition of bromine

to the nutrient solution and the removal of flower buds and bolls, the concentration of sugar in the fibrous roots had tripled and the concentration of bromine had increased 60 per cent. over the control plants. The weight of bromine accumulated by entire defruited plants was double that found in the control plants. The fibrous roots of the defruited plants had a slightly higher concentration of nitrogen and a significantly higher concentration of potassium at the end of the experiment.

500. INVESTIGATIONS ON THE SALT RESISTANCE OF COTTON. By V. A. Novikov. (*Bull. Acad. Sci. U.S.S.R.*, Ser. Biol. No. **6**, 1943, p. 307. From *Pl. Bre. Abs.*, xv., **2**, 1945, p. 149.) Cotton plants belonging to several varieties were grown in soils of different degrees of salinity. The physiological and other reactions of the plants were observed. The yield and general condition of the plants deteriorated as the salinity of the soil increased, but the plants acquired succulent characters and showed a certain capacity to adapt themselves. During the germinating stage they were least immune to the ill-effects of salinity; therefore breeders who seek to adapt cotton to saline soil must produce varieties which can withstand salinity at this particular stage of growth; high degrees of salinity can be tolerated as the plants grow; those which withstand it best when seedlings withstand it best when fully grown. The following varieties proved to be capable of surviving high degrees of salinity: *Gossypium barbadense* No. 670—the germination of which was 74 per cent. at 0·4 normal salinity—and the local Asiatic (*G. herbaceum*) and Indian (*G. neglectum*) cottons. These may be of use for hybridization. Only 7 of the 37 American cottons (*G. hirsutum*) were found to withstand salinity up to 0·4 normal.

501. LIGHT, DROUGHT, AND HEAT AS FACTORS IN COTTON BOLL-SHEDDING. By A. A. Dunlap. (*Phytopathology*, **34**, 1944, p. 999. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 253.) Certain varieties of Upland cotton have shown considerable resistance to the effects of inadequate light. This reaction predisposes the plant to shed its immature bolls.

502. THE SHEDDING OF BUDS AND CAPSULES IN THE COTTON PLANT, AS INFLUENCED BY THE LENGTH OF DAY. By V. A. Novikov. (*Bull. Acad. Sci. U.S.S.R.*, Ser. Biol. **1**, 1944, p. 29. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 253.) In order to discover the nature of the connexion between the length of day and the shedding of the buds and capsules which has been observed in cotton plants, the varieties Pima (*Gossypium barbadense*) and No. 8517 (*G. hirsutum*) were grown under two sets of conditions, viz., when the duration of daylight was long, and when it was short (10 hours). It was observed that during 10-hour days shedding of the buds and capsules was more frequent than during long days, and was the result of the reduced quantity of photosynthetic products formed during the shorter periods of daylight, and available to the buds and capsules. As the days grew shorter and photosynthetic activity diminished, shedding increased especially among the buds formed late in the season.

503. THE MATURITY OF COTTON FIBRE. By A. N. Gulati and N. Ahmad. (*Ind. Frmg.*, January, 1945, p. 9.) Describes the development of the cotton fibre, its appearance under the microscope, and the influence of certain agronomic factors upon its development. Maturity count is explained, and brief accounts are given of the relationship between fibre maturity and spinning quality of cotton, the effect of environment and of hybridization on fibre maturity, and the effect of variety.

504. VARIATION IN THE MEASURABLE CHARACTERS OF COTTON FIBRES. By R. L. N. Iyengar. (*Ind. J. Agr. Sci.*, xiv., June, August, 1944, pp. 222, 311.) VII. (*a*) *Variation due to irrigation.*—Describes a field experiment and a pot-culture experiment carried out on Co.2 cotton to test the effect of different types of irrigation on the fibre length, uniformity of length, and fibre maturity. The following conclusions are presented: (1) The lowest supply of water probably tends to reduce the mean fibre length to a small extent, though it is not statistically significant. (2) The uniformity of fibre length appears to be less in plots with no irrigation in the field experiment; in the pot-culture experiment no definite trend is indicated. (3) Hardly any variation is effected in the fibre weight. (4) No variation is caused in the fibre maturity.

(*b*) *Variation due to spacing.*—Three kinds of spacing, 4 inch, 9 inch, and broadcast sowing were tried for the Co.2 cotton in each of the four irrigation treatments above described. The results indicated that none of the different spacings considered caused any change in the fibre length, uniformity of length, or fibre maturity.

VIII. *Variation between regions of the seed surface.*—The results of the study are summarised as follows: (1) At the micropylar region the fibres are thinly populated, short, very mature, have the highest fibre weight, standard fibre weight, fibre diameter, fuzz diameter, and fibre strength, and are most firmly attached to the seed. (2) At the chalazal end the fibres are very densely populated, are longer and more immature—considerably more immature in some cottons—have smaller fibre weight per cm., standard fibre weight, fibre diameter and fibre strength, and are less firmly attached to the seed. (3) At the other regions the variations among the fibres do not appear to be conspicuous; generally speaking the values lie intermediate between those for the two regions considered above, though they approach the values for both of the two regions in some cases.

The probable cause for the variation observed in the different regions is considered. In the opinion of Balls (1938) it is doubtless "largely a question of nutrition, dependent upon the anatomy of the vascular bundles on the seed coat." In regard to the cross-sectional area of the fibre he states that "the proximate causes for this variation can be traced to the life history of the hair. It depends only slightly upon the variations in the original diameter of the cell. Principally it is brought about by the differences in the thickening of the secondary wall." The present results in the case of the micropylar and chalazal ends of the seed indicate that about two-thirds of the weight is accounted for by the secondary thickening, the rest one-third being due to the original cell diameter. Moore's (1941) findings of the venations on the seed coat and of the differences in the structure of the cells below the epidermis in the different regions offers a partial explanation. Further study is suggested.

505. Further Data on the Inheritance of Lint Colour. By R. A. Silow. (*J. Hered.*, **36**, 1945, p. 62. From *Pl. Brc. Abs.*, xv., **3**, 1945, p. 253.) Genetic analysis of the range of variation in lint colour in the cultivated Old World cottons has been continued. A fourth main locus for colour, Lc_4, has been identified in a khaki-linted strain of *G. arboreum* from Burma. Further multiple allelomorphism at the Lc_2 locus has been revealed. Considerable genotypic variability in minor lint colour due to the action of modifying genes has been found in *G. arboreum* race *indicum*.

[*Cf.* Abstr. 452, Vol. XXI. of this Review.]

506. Inheritance of Strength of Lint in Upland Cotton. By J. O. Ware and D. C. Harrell. (*J. Amer. Soc. Agron.*: **36**, 12, 1944, p. 976. From *Exp. Sta. Rec.*, **92**, 5, 1945, p. 649.) Parental lines were grown along with F_1, F_2, and F_3, first-generation backcrosses, and second-generation backcrosses from a Florida Green Seed and Rowden cotton cross for comparisons, and for use in recrossing and in the backcrossing. The F_1 was repeated in the second and third years. The first backcross was made with F_1 in 1939 to both parental lines. In 1940, plants in the respective first-generation backcrosses were backcrossed again to corresponding recurrent parental plants. Florida Green Seed stock had the higher strength index, which was about 1 unit higher than in Rowden as determined by use of the Pressley strength tester. Inheritance of strength appeared to be intermediate with slight tendency to weak dominance; in repeated backcrossing the level of strength is easily shifted in either direction. Strength in F_3 progenies from plants selected out of the several F_2 class intervals did not exhibit as much uniformity as shown by either parent, but these F_3 plants tended to maintain the F_2 level of origin. In 1939 and 1941 the respective parental lines were at about the same level, but higher in 1940. In several hybrid groups the 1941 level was lower than the 1940 level. Environment was a factor and doubtless contributed to expression of variability and in changing season mean levels, yet the yearly combination or set-up permitted reliable genetic measures.

507. Linkage Relations of the li_d Gene for Lintlessness in Asiatic Cottons. By G. K. Govande. (*Curr. Sci.*, **13**, 1944, p. 321. From *Pl. Bre. Abs.*, xv., **3**, 1945, p. 196.) In a further study of the gene li_d, the Baroda lintless mutant was crossed

with the white pollen mutant Coconada 45, the Burma laciniated A8, and a new multiple recessive which was isolated from a cross of N6 multiple recessive with Coconada 45. Results show that the li_d gene for lintlessness in the Baroda lintless mutant is linked with the leafshape locus with a cross-over value of 17·05 per cent ± 1·72, and with the lint colour locus with a cross-over value of 20·46 per cent ± 1·97. The leaf-shape gene is linked with the lint colour gene with a cross-over value of 26·93 per cent ± 2·28, a value which confirms the linkage reported by Hutchinson with a cross-over value of approximately 30 per cent.

[*Cf.* Abstr. 452, Vol. XI., and Abstr. 204, Vol. XXII. of this Review.]

508. The Selection Experiment with Peruvian Tanguis Cotton. By S. C. Harland. (*Bull. Inst. Cott. Genet.*, Lima, Peru, 1944 : No. 1. From *Pl. Bre. Abs.*, xv., **2**, 1945, p. 149.) The Tanguis variety, predominant in Peru, originated from a single plant of *Gossypium barbadense* found in a crop of *G. hirsutum*. In the author's view, this plant was a relic of the indigenous *G. barbadense* variety Semi-aspero, remnants of which survived as an impurity in *G. hirsutum* for many years, and were modified by natural selection in the direction of early maturity. Tanguis was originally resistant to *Verticillium* wilt and was very high-yielding. The lint was long, coarse and white, and the ginning percentage very high. In the course of its spread through Peru, the variety became very mixed, and breeding work to establish a superior type was started in 1940. The methods used are reported in detail. Pure line selection was not adopted, the author giving reasons to show that the extra uniformity obtainable by this method would not be an advantage in a relatively coarse cotton. In his opinion, most pure-line breeding has been on far too small a scale to be effective, and it has resulted in the loss of valuable genes and the retention of undesirable ones. The initial material for breeding consisted of 22,000 single-boll samples. These were reduced to 2,863 by eliminating those with lint less than 1¼ inches long or of bad colour. A single row of 11 plants was raised from each boll in 1940-41, rows which fell below fixed standards for lint length, boll weight, ginning percentage or yield being rejected. Subsequent rejection of rows with bad lint colour reduced their number to 41, from which 200 plants were selected. Seed from these was sown in a replicated trial. In 1942, correlation studies showed that selection for lint length, boll weight, ginning percentage and yield had been effective even on single rows of 11 plants. A considerable all-round improvement was obtained in the variety. The 200 strains under trial were reduced to 43 on the basis of the above four characters, and also on fineness and colour of lint, individual strains failing to come up to a set standard in any one of the six characters being rejected. These 43 strains formed the basis of the first two commercial multiplications of seed distributed by the Institute. For further breeding, the best 10 strains were taken, 10 plants from each, the selection being on much the same lines as previously. Of the 100 plants so tested, 63 were retained for bulk multiplication. It is intended to continue breeding in this way, so that successive distributions of seed will displace older types, and deterioration through admixture or crossing will be minimized. A study was made of the errors involved in estimating lint length by a commercial grading method and by the measurement of halo length on combed seeds. In an appendix some genetical data are given. In crosses with Sea Island, Tanguis is shown to carry dominant genes for hairiness (H^{TA}), yellow corolla (Y) and yellow pollen (P).

509. "Twinning" in Cotton. By R. A. Silow and S. G. Stephens. (Reprinted from *J. Hered.*, xxxv., **3**, March, 1944, p. 76.) Twinning in the Sea Island cottons is considerably more frequent than in other types of cultivated cottons for which data are available. In the Sea Islands most twin pairs are diploid/haploid, and the few cases of diploid/diploid twins which occur probably start off as diploid/haploid. In the Asiatic cottons twins are predominantly of the diploid/diploid type, and both members are most probably the result of fertilization. The New World and Asiatic cultivated cottons are respectively tetraploid and diploid, but it would be unwise to assume at this stage that the difference in type of twinning which they exhibit is a function of degree of ploidy, especially in view of the fact that the only case of twin-

ning which has been reported amongst the wild diploid species, *G. sturtii* F.v.M., (Weber, 1940) was of diploid/haploid nature. The balance of evidence at present suggests that the difference is genotypically controlled.

Concerning the value of haploids, Harland (1936) suggested that induced chromosome doubling in a haploid with the immediate production of a pure line as a result would be of practical importance to the plant breeder. Beasley (1940) has successfully produced pure lines of Upland and Sea Island strains by colchicine treatment of haploids, and a pure line of St. Vincent Sea Island (V135) has also been produced at the Cotton Research Station, Trinidad, by the same method. It is doubtful, however, whether a pure line has any great practical advantage over moderately heterozygous material. Hutchinson (1940) stressed the point that average performance of the population is the important factor, and that residual variability may be advantageous in "buffering" environmental fluctuations. Nevertheless, artificial doubling of haploids might on occasion provide a short cut in isolating strains from highly heterozygous material. Another possible use for a doubled haploid is as an indicator of the magnitude of environmental heterogeneity. As such it could serve as a control in progeny row breeding.

510. Plant Improvement by Use of Drugs. By P. T. Thomas. (*Market Gr.*, London, pp. 2. From *Pl. Bre. Abs.*, xv., **2**, 1945, p. 100.) This article describes the use of colchicine and acenaphthene for the production of polyploids.

511. Some Western Nectars and their Corresponding Honeys. By G. H. Vansell. (*J. Econ. Ent.*, **37**, 1944, p. 528. From *Pl. Bre. Abs.*, xv., **2**, 1945, p. 149.) Varietal differences in the quantity and composition of nectar in cotton and oranges are indicated. It is believed that such differences influence the activity of visiting bees.

FIBRES, YARN, SPINNING, WEAVING, ETC.

512. Cellulose Fibres: Organic Vapour Sorption. By K. Lauer. (*Kolloid Z.*, **107**, 1944, p. 86. From *Summ. Curr. Lit.*, xxv., **7**, 1945, p. 160.) Adsorption isotherms of purified cotton for all organic liquids investigated deviate from the S-shaped isotherm characteristics for water. Nevertheless, the adsorption isotherms for the lower (polar) alcohols (methyl and ethyl alcohol) reflect, as do those for water, the overlapping of adsorption and swelling phenomena, though in a different order. In contrast, propanol, isopropanol, butanol, benzene, toluene, paraffin hydrocarbons, carbon tetrachloride and chloroform produce pure adsorption isotherms without involving swelling phenomena. Acetic acid produces swelling only, whereas acetone shows indifferent behaviour at low and adsorption at higher vapour pressures.

513. Cellulose Fibres: Strength and Structure. By K. Lauer. (*Kolloid Z.*, **107**, 1944, p. 93. From *Summ. Curr. Lit.*, xxv., **7**, 1945, p. 160.) This paper, which is mostly speculative, deals particularly with the dry and wet strength of native cellulose and cellulose hydrate fibres as measured in water and organic liquids. An explanation for the different behaviours of the various types of fibres toward different immersion liquids is attempted on the basis of two assumptions. (1) The native cellulose fibre is conceived as being built up of spiral ribbons composed of lamellae, representing the crystalline portion of the fibre, with the amorphous portions between the spiral ribbons; the lamellae are considered as composed of fibrils which run parallel to the fibre axis. In contrast, cellulose hydrate fibres are pictured as lacking the spiral ribbon arrangement, the crystalline and amorphous portions being arranged at random. (2) Herman's β-glucopyranose model is considered, in which the hydroxyl groups are located on one side of a plane, and are believed to be projected parallel to the fibre axis through the anhydro-glucose ring, whereas the hydrogen atoms are located on the other side of the plane. The behaviour of various fibres on freezing at −150° is considered. Cotton fibres show no loss in tensile strength, whereas staple fibre loses from 10 to 40 per cent. The swelling ability of the cotton increases, that of the staple fibre decreases.

514. Fibres: Microscopy; Nitrogen Dioxide Pretreatment. By M. L. Rollins. (*Text. Res. J.*, **15**, 1945, p. 65. From *Summ. Curr. Lit.*, xxv., **13**, 1945, p. 305.)

Fibres which had been treated with nitrogen dioxide were observed under the microscope during swelling with lyotropic reagents. Nineteen sets of photomicrographs made at various stages in the swelling processes are reproduced and discussed. Cotton fibre sheath (primary wall and "winding layer") splits into fine fibrils or into broad spiral bands, depending on the degree of oxidation. Reversals were observed in the fibre sheath; these may be in the "winding layer" or inner sheath beneath the primary wall, but caused to adhere to it by the nitrogen dioxide treatment. The fibre sheath appeared to have a banded structure when not ruptured by swelling of the cellulose beneath it. No spiral structure was observed in any layer of the secondary wall of cotton below the inner sheath, but the lamellæ of the secondary wall seemed to disintegrate into fine fibrils lying more or less parallel with the fibre axis.

515. Cotton Fibres: Immaturity Count in Polarized Light. By M. A. Grimes. (*Text. World*, **95**, 2, 1945, pp. 161, 214. From *J. Text. Inst.*, August, 1945, A348.) A polarizing microscope as used in petrography with magnification of 100 diameters is adjusted so that the Nicol prisms are crossed, the ocular is set with its cross-hairs at 45° to the plane of polarisation and a selenite plate (red, first-order) is placed in position. Cotton fibres mounted on a slide parallel with respect to the arrow on the selenite plate are then examined. Very immature fibres appear violet or indigo, immature fibres blue, mature fibres green or yellowish green, and over-mature fibres yellow. When rotated through 90°, the violet fibres become orange, blue fibres change to yellow, yellow fibres become yellowish-green, and yellowish-green fibres do not alter. Immature fibres exhibit almost complete parallel extinction, but mature fibres no extinction when rotated through 360°. These colour changes following rotation of the field serve to check doubtful appearances. The author regards an immaturity count based on the above effects as superior to the usual count based on swelling in 18 per cent. caustic soda. Her evidence is given in the following tables: (1) Maturity counts by the two methods on 25 slides totalling 6,874 fibres. Two independent workers differed on the average by less than three in the count on an average slide. The caustic soda method gave 24·4 per cent. immature fibre, the polarised light method 24·6. (2) Measurements of fibre diameters, wall thickness and lumen for a collection of the yellow and yellowish-green fibres and for the blue+violet fibres, separately, after swelling in 18 per cent. caustic soda. (3) Immaturity counts by the two methods on eighty-seven different cottons.

516. American Cotton: Fibre Characters and Spinning Quality. By T. S. Harris. (*Cotton*, U.S.A., **108**, 11, p. 93; 12, p. 100, 1944. From *Summ. Curr. Lit.*, xxv., **9**, 1945, p. 211.) A number of examples are given of the work of the testing laboratory at the Tallassee Mill, U.S.A., which is equipped to do immaturity tests (Shirley Institute method), fibre strength tests (Pressley instrument), and stapling tests (Suter-Webb sorter and Hertel Fibrograph), as well as the familiar yarn tests. (1) *Fibre strength and yarn strength.*—Fifty bales of cotton were tested for fibre strength, and the strongest six and the weakest six were selected for spinning tests, both individually and as two 6-bale mixings. Particulars are tabulated. In the mixings, the weak fibre gave significantly weaker and poorer-looking yarn in 13s. count. One of the bales of weak fibre gave yarn as strong, in 22s., as the strong fibre, but it was found that the compensating factor was longer staple. By multiplying the "fibre length at the 25 per cent. point" (point on the staple diagram where 25 per cent. of the array is longer than the staple length and 75 per cent. is shorter), by the fibre strength a quantity called the "cotton strength factor" was obtained that accounted for the high yarn strength of this weak cotton. (2) *Mixing of staples.*—Tests were made on the blending of a stock of $\frac{7}{8}$ inch cotton for use in the mill's regular 1 inch cotton qualities. Poor results were obtained from blends with $\frac{15}{16}$ inch and 1 inch cottons but satisfactory results in blends with longer cottons. Mixings were made as follows: (A) $1\frac{1}{16}$ inch cotton 75 per cent., $\frac{7}{8}$ inch 25 per cent.; (B) $1\frac{1}{32}$ inch 75 per cent., $\frac{31}{32}$ inch 25 per cent.; (C) 1 inch 83 per cent., $1\frac{1}{32}$ inch 17 per cent., the average lengths being approximately equal. Mixing A gave the

strongest yarn and fewest "ends down," although the range of staple length was so much wider than in (C). However, the fibre strength was greatest in (A) and also the "cotton strength factor." (3) "*Character*" *and spinning quality.*—That fibre strength and length alone do not determine all that is comprised in "spinning quality" is shown by a comparison between the popular Stoneville 2B cotton and a delivery described as of "soft character." Judged by length and fibre strength the "soft" cotton should have given nearly as good a yarn as Stoneville but it proved to be hopelessly bad. It contained nearly 50 per cent. of immature fibre and was extremely neppy. (4) *Tests on a new strain of cotton.*—A new strain, Bobshaw No. 1, gave a markedly better yarn than Stoneville 2B; it was somewhat shorter in length but coarser and stronger.

517. Cotton Fibres: Strength Changes on Conversion to Viscose Rayon. By H. Hoffmann. (*Zellwolle u. Kunsteide*, **2,** 1944, p. 45. From *Summ. Curr. Lit.*, xxv., **9,** 1945, p. 203.) The chemical operations of the viscose process, carried out so as to retain the fibre structure, exert a surprisingly slight effect on the strength of single cotton fibres. Dry strength is hardly diminished provided the ripening period is not extremely long. A longer period of ripening causes lowering of wet strength. The lowest relative wet strength was still 86 per cent., and thus much higher than the 50 per cent. of rayon. It might be possible to avoid the completely dissolved stage, which appears to be responsible for the low strength of rayon, by utilizing directly the plastic properties of the xanthate.

518. Fibres: Swelling. By B. R. Roberts. (*Text. Res. J.*, **15,** 1945, p. 46. From *Summ. Curr. Lit.*, xxv., **13,** 1945, p. 305.) The application of a combination of ultra-microscopy, micromanipulation, kinemicrography, and selective swelling to the study of fibre structure is described. Kinemicrographs showing Brownian movements within swollen starch grains and cotton fibres and the eruption of colloidal masses from ruptured walls, and also Brownian movement within swollen wool scales, are presented and discussed.

519. The Tensile Behaviour of Raw Cotton and other Textile Fibres. By R. Meredith. (*J. Text. Inst.*, May, 1945, T107.) Discusses the subject under the following headings: *Introduction. Fibre Characters Measured:* fineness, strength; extensibility; yield stress and strain; work of rupture; variation within a sample. *Materials Tested and Sampling Methods. Experimental Methods:* weighing the fibres; recording the load-extension curves. *Measurements on the Stress-Strain Curves. Discussion of Results:* cottons; bast and other vegetable fibres; rayons; silk, nylon and Vinyon; wool, hair and casein fibres; comparison of different fibres. Two appendices are included on (*a*) Densities of Textile Fibres; (*b*) Data for Stress-Strain Curves of Various Fibres. There are 55 references to the literature on the subject.

520. Cotton: Hand Testing. By E. H. Helliwell. (*Text. World*, **94,** 12, 1944, pp. 82, 129. From *J. Text. Inst.*, May, 1945, A213.) A broad description is given of hand methods for judging the "character," "body" (clinging power), strength, staple, and neppiness of a sample of raw cotton.

521. Cotton: Carding. By E. B. Grover. (*Text. Res.*, **14,** 1944, p. 403. From *J. Text. Inst.*, May, 1945, A204.) Tentative conclusions and observations reached in research on cotton carding at the U.S. Textile Research Institute include the following: (1) Considerable increases in card production per unit are feasible without detrimental effects on the quality of the product; (2) Yarn strengths are not impaired significantly as a result of increased card speeds; (3) Yarn character or appearance is affected only to a moderate degree by increases in card speeds; (4) Neppiness is affected more by the condition of the raw material than by changes within the card; (5) Cotton of high fibre strength will result in good processing and strong yarn; (6) Fibre strengths are not impaired by increased card speeds; (7) Average fibre lengths by weight remain unchanged over wide ranges of card speeds; (8) Waste removal can be controlled at least to a limited extent to allow high production without serious deterioration in the quality of the product; (9) Peak power demand charges are not increased by the use of high over-all card speeds; (10) Further investigation is needed and will be made on the effect of front knife plate settings.

522. Acid Finishes on Cotton. (*Text. Rec.*, **62**, 1945, pp. 45, 46, 65. From *Summ. Curr. Lit.*, xxv., **9**, 1945, p. 209.) A historical review of the development of acid finishes from the time of Mercer, with special reference to the Heberlein processes, and recent processes of the Tootal Broadhurst Lee Co. in which the effects of sulphuric and other mineral acids are restrained by means of formalin.

523. Cotton Fabric Laminates: Properties. By R. N. Prince and J. Seiberlich. (*Rayon Text. Mnthly.*, **25**, 1944, p. 447. From *J. Text. Inst.*, March, 1945, A119.) A brief report is given of an investigation in which 20 samples of cotton fabric covering 7 styles were impregnated with Bakelite syrup (the highly alkaline BV 16238 + the catalyst XK 16253) under conditions that secured about 50 per cent. of plastic in the fabric, dried at 175° F., and formed into single-ply laminates in a press at 330° F. The press was closed at about ¾ lb. per sq. in. for one minute, opened to release gas, closed again for 4 minutes and then held at 70 lb. for 3 minutes. The products were tested for tensile strength, *p*H by a spot test, absorption of water on immersion (at half-hour intervals up to 4 hours, then at 24 hours, and then daily), and resistance to "drawing." In the "draw" test, a specimen 120 mm. square, cut in the line of the warp and weft, was placed over a half-spherical depression in a mould and forced into the hole under a half-spherical plunger in a press until rupture occured. The distance moved by the platens of the press was recorded and also the nature of the break. No data are recorded, but a summary is given of the behaviour of the different cloths with regard to swelling in the plastic syrup, the amount of plastic retained, the rate of water absorption, the influence of the size and moisture contents of the original cloths, and the effect of the "Sanforized" shrink finish.

524. Cotton Insulation. By E. H. Omohundro and N. B. Salant. (Printed and distributed by the National Cotton Council of America, Memphis, Tennessee, 1944.) A pamphlet describing, under the following headings, some of the properties of cotton insulation: Insulating value of Cotton; Weight and Resiliency of cotton insulation; The Effect of Freezing and Thawing on cotton insulation; Non-capillarity, Cohesiveness, and Flame Resistance of cotton insulation; Permanence of flame resistance; Repellence to mildew and to household pests; Handling and installing cotton insulation.

525. British Cotton Industry: Efficiency. (1) T. Maloney. (2) B. B. Joshi. *Ind. Text. J.*, **55**, 1945. (1) p. 220; (2) p. 226. (From *Summ. Curr. Lit.*, xxv., **9**, 1945, p. 225.) (1) The writer discusses the Platt Report (Cotton Textile Mission to the U.S.A.) and gives particulars of many British machines that are at least the equivalent of similar American machines. The recommendations of the Report are summarized and the importance of changes in labour organization and work allocation are emphasized. (2) The Platt Report is read through Indian eyes and Indian mill conditions are discussed in the light of the findings and recommendations.

526. American Blowing Room Plant: Comparison with British. (*Text. Rec.*, **62**, 1945, pp. 36, 68. From *Summ. Curr. Lit.*, xxv., **12**, 1945, p. 278.) An illustrated account is given of the layout of typical blowrooms in British and American cotton mills. The main differences are summarised thus: (1) Hoppers are dispersed throughout the plant in British mills, but concentrated in the initial section of the American equipment. (2) Consequently, mixings of 24-48 bales can be made in the American mill as against 6-12 in the British mill. (3) The Crighton opener is placed before the porcupine cylinder on the American system, but after it on the British. (4) The American plant uses mechanical methods of distribution; the British plant favours pneumatic means. (5) The American plant makes more use of bladed beaters and reserve boxes. (6) The American layout is more compact; there is less overhead trunking. (7) The British location of the Crighton opener (with by-pass arrangement) secures greater adaptability, but this is not so useful a feature in the American mill, because of the greater standardisation of the mixings.

527. Cotton Mill: Electrification. By S. Birchall. (*Text. Wkly.*, **35**, 1945, pp. 738, 784, 830. From *Summ. Curr. Lit.*, xxv., **10**, 1945, p. 245.). A report of an address and conference of mill managers and engineers on various types of electric driving, their advantages, installation, and maintenance.

528. Cotton Mill: Labour-Saving Devices. By O. Glaessner. (*Text. Wkly.*, **35,** 1945, pp. 582, 686. From *J. Text. Inst.*, May, 1945, A236.) A report of a lecture and discussion under the headings (*a*) reducing the human effort required to perform duties in the spinning mill, (*b*) replacement of human effort by steam or electrical power, and (*c*) analysing the application of steam power in the form of mechanical or electrical energy.

529. Cotton Mill: Reorganization. (*Text. Rec.*, **62,** February, 1945, pp. 38, 62. From *J. Text. Inst.*, May, 1945, A205.) A spinning mill manager offers suggestions for increasing the production per man-hour by known improvements in the blow-room, carding, draw-frame and speed-frame processes, spinning, winding, and beaming. He claims, however, that Government support is the main requirement, including favourable labour supply and export policies, and a different measure of taxation.

530. Cotton Spinning Mill: Reorganization. By J. Airey. (*Text. Wkly.*, **35,** 1945, pp. 354, 398, 438. From *J. Text. Inst.*, May, 1945, A205.) A report of an address on new developments in opening, carding, drawing, drafting, spinning and machine driving that are available for the modernization of Lancashire spinning mills. A discussion is appended.

531. Cotton Operatives: Employment Policy. By J. S. Haydock. (*Text Wkly.*, **35,** 1945, pp. 442, 456. From *J. Text. Inst.*, May, 1945, A236.) A report of a lecture on the introduction and training of new workers, and the status and training of mill officials as main aspects of the employment policy of the British cotton industry. A discussion is appended.

532. Cotton Tyre Cord: Stretching. Strength, and Extensibility. By H. J. Phillip and C. M. Conrad. (*J. App. Physics*, **16,** 1945, p. 32. From *Summ. Curr. Lit.*, xxv., **9,** 1945, p. 205.) Cotton tyre cords, differing with regard to gauge, construction, and variety of cotton, were subjected to stretching treatments involving various combinations of tension, heat, and moisture. All these treatments increased the strength of the cords, but reduced their gauge and elongation at 10 lb. The greatest increase in strength was produced by stretching in a swollen condition in the presence of heat. Increases in count-strength product from 48 to 83 per cent. were observed. Experiments showed a reciprocal relationship between the strength and the elongation at 10 lb. obtainable by single-stretching treatments of tyre cord, which makes impossible the control of elongation, independently of strength. Elongations of the bone-dry cord of about 6 per cent. at 10 lb. which is considered to be the optimum for such cords, could be obtained only with negligible increase in strength. The original elongation was restored by treating highly stretched tyre cord with water at room temperature for 30 min. or with boiling water for 3 min., whilst most of the increase in strength resulting from stretching was retained. A tyre cord that had been stretched in the hot and wet state, after treatment with water had equal elongation, but greater strength as compared with the untreated cord. A dual-stretching method was devised which permits the control of elongation at 10 lb. independently of strength. The treatment consists of two phases: the first imparts to the cord the maximum potential breaking strength, and the second serves to adjust the elongation at 10 lb. to a pre-determined controlled value, while maintaining over 90 per cent. of the maximum count-strength product. Control of the elongation is achieved by proper selection of tension and degree of swelling during the second phase of the dual-stretching treatment.

533. Cotton Wax: Determination. By C. M. Conrad. (*Ind. Eng. Chem., Anal. Edn.*, **16,** 1944, p. 745. From *J. Text. Inst.*, April, 1945, A169.) Methods for the determination of the wax content of cotton are critically reviewed, and the advantage of ethyl alcohol over chloroform as a solvent for cotton wax is demonstrated. A method for the determination of total wax in cotton fibre is proposed in which the wax is first extracted with hot 95 per cent. ethyl alcohol and then transferred to chloroform through a phase-separation process, in order to eliminate sugars, mineral constituents and other non-waxy constituents removed at the same time by the alcohol.

534. Cotton Yarn: Twist Testing and Uniformity. By T. O. Ott. (*Text. World*, **95**, 1, 1945, pp. 79, 188. From *Summ. Curr. Lit.*, xxv., **11**, 1945, p. 262.) Papers published in the United States during the past decade on the relationships between the number of twists per inch, contraction on twisting, tensile strength and elongation at break, count, angle of twist, and related factors are reviewed, and subjects for further research are mentioned.

535. Neps in Cotton Yarns as Related to Variety, Location, and Season of Growth. By N. L. Pearson. (*Tech. Bull. No.* 878, December, 1944, U.S. Dept. of Agr., Washington, D.C.) To determine the extent to which neppiness in cotton yarn varies with variety, location, and season, and the extent to which these variations can be explained by variations in fibre length, fibre weight per inch, and percentages of thin-walled fibres and large motes, the neps were counted in 50-yard samples of 22s. yarn, representing 2 series for each of 16 varieties grown at 8 locations for 3 successive years (1935-37). Variety, location, and season, and their interactions affected significantly the number of neps in yarn made from the cotton. The effect of variety was greatest. The tendency for varieties to show a differential response to the effect of location and of season was not so great as their tendency to rank about the same from station to station or from year to year. There was a significant general tendency for the number of neps in yarn to increase with increases in fibre length, decreases in fibre weight per inch, and increases in percentage of thin-walled fibres. Varietal differences in neppiness may be accounted for to a significant extent by heritable differences in fibre length and in fibre weight per inch, and to a questionable extent by the percentage of thin-walled fibres when each property is considered separately. The combined influence of these three properties accounts to a considerable extent for the varietal differences in yarn neppiness. Beta coefficients, however, show that fibre length ranks first in importance, with weight per inch nearly as important, but that the percentage of thin-walled fibres by itself accounts for little of the varietal differences in neppiness. Varieties having a high percentage of large motes tend to be more neppy than those having a low percentage. The effect of location on neppiness cannot be accounted for by station differences in any one of the three fibre properties, though a small degree of station variance may be accounted for if the three properties are considered together. Station differences in neppiness, however, follow closely station differences in the percentage of large motes. Large motes may not be directly related to nep formation but their relative number in seed cotton may possibly indicate the nep-forming potentialities of the lint. Differences in the number of neps in yarn representing the different years can be attributed to some extent to yearly differences in maturity of the fibres, expressed either in weight per inch or in percentage of thin-walled fibres. A fairly large part of the varietal variance in neppiness and much larger parts of the station and yearly variance remain unexplained. It is possible that the solution of the problem may be found in some other fibre or lint properties that vary with variety and respond in a very marked degree to factors that vary with location and season.

536. Mildew- and Rot-Resistance Tests: Co-operative Study. American Assoc. of Textile Chemists and Colorists Sub-Committee on Mildew-Proofing. (*Amer. Dyes. Rpt.*, **34**, 1945, pp. 128, 139. From *Summ. Curr. Lit.*, xxv., **12**, 1945, p. 283.) The tests studied were (1) *Chaetomium globosum*, direct inoculation-sterilized specimen method; (2) *Metarrhizium glutinosum*, pre-inoculation, unsterilized specimen method; (3) *Aspergillus niger* (nutrient salts-agar method); (4) *Aspergillus niger* (malt extract-Partansky method); (4*a*) *Chaetomium globosum* (malt extract-Partansky method); (5) Soil burial; (6) Soil suspension. The tests were applied to cotton sheeting treated with (i) copper naphthenate, (ii) dihydroxydichlorodiphenylmethane, and (iii) phenyl mercury·triethanol ammonium lactate, five concentrations of each being used. Details of the test procedures are given. Results are presented in tables and graphs and are discussed. In general, the data show that the greatest variations among individual laboratory results occur with samples treated with the lower concentrations of fungicides. Test (1) is appreciably less severe than test (2). *Aspergillus*

niger tolerates Cu and Hg compounds at high concentrations and is effective in detecting inadequate concentrations of chlorophenolic compounds. The *Aspergillus* test, using visual estimates of the amount of growth, may be a very useful test providing differentiation is made between the growth of *Aspergillus niger* on the agar surface and on the fibre itself. *Chætomium globosum* is sensitive to copper naphthenate but is moderately tolerant to certain mercury treatments. Soil burial tests (7 days) are inadequate except for eliminating such treatments for prolonged soil contact as treatment (iii). Differentiation between concentrations in the other treatments was shown in 14-day soil burial tests. Soil suspension tests appear to be worthy of further consideration. Fabric treated with copper naphthenate is almost immune from *Chætomium* attack at concentrations of 0·125 per cent copper and above but is more definitely affected in the *Metarrhizium* test. In the soil contact tests, the resistance displayed by the copper treatment at fourteen days does not differ greatly from that observed in the *Metarrhizium* test. Sheeting to which treatment (ii) is applied is also attacked more severely by *Metarrhizium* than by *Chætomium*. It shows less resistance than cloth given the copper treatment to soil contact after fourteen days. Treatment (iii) although performing moderately well in certain pure culture tests appears to be the least resistant of the three, especially in soil contact tests. It appears to be possible to arrive at a fairly practical evaluation of fungicidal treatments by the use of two or more tests including one or more pure culture and one soil contact test.

537. Study of a Soil-Burial Method of Determining Rot Resistance of Fabrics. By D. M. Batson *et al.* (*Amer. Dyes. Rptr.*, xxxiii., **21**, p. 423, **22**, p. 449, 1944. From *Rev. App. Mycol.*, xxiv., **4**, 1945, p. 158.) A review is given of the literature dealing with the mildewing and rotting of fabrics, and with methods of testing the resistance of such materials to microbial invasion. Various disadvantages were found to be inherent in the standard soil burial method evaluation, and an attempt was therefore made at the Southern Regional Research Laboratory, New Orleans, to devise a more suitable procedure. The tests were carried out in covered outdoor beds, using a soil mixture of equal volumes of coarse sand, clay loam, and well-rotted manure, a 9- to 10-in. deep layer of which was maintained at a moisture content near 28 per cent. and a temperature of 85° to 90° F. Untreated and rot-proofed $6\frac{1}{4}$-oz. cotton osnaburg and $8\frac{1}{2}$-oz. jute burlap were tested, the treated fabrics containing 10 per cent. by weight of copper naphthenate (equivalent to 1 per cent. copper). Strips $9 \times 1\frac{1}{2}$ to 2 in. were buried vertically to a depth of 7 in., and five of each sample were removed at frequent intervals for breaking-strength measurements. The period of burial required for complete decay of both the untreated materials was six to eight days, whereas the impregnated strips of osnaburg and jute resisted disorganization for roughly seven and seventeen times longer, respectively. In preliminary tests on cotton osnaburg in an indoor bed, horizontally buried strips lost breaking strength at about the same rate at varying depths below 1 in. but more slowly at $\frac{1}{4}$ in. At or below 1 in. the strips were completely rotted in six days at a soil temperature of $86 \pm 2°$, and in eight at $75 \pm 4°$. Strips buried vertically in trenches rotted uniformly at varying depths, while those pushed down with a metal blade decayed most rapidly in the lower portions. On the basis of these results it is recommended that (*a*) an 85 per cent. loss in breaking strength be considered as the practical end point of fabric-rotting, and (*b*) the rot resistance of a fabric be expressed as the ratio between the number of days' burial required to cause such a loss in any given fabric and the number of days necessary for a comparable effect to develop in copper naphthalene-treated specimens of the same fabric containing 1 per cent. copper.

538. Fabric Deterioration by Thirteen Described and Three New Species of *Chætomium*. By G. A. Greathouse and L. M. Ames. See Abs. 462.

539. Deterioration des Fils Textiles par le Mildiou. By B. Louys. (*Industr. Text.*, **60**, Juin, 1943, p. 110. From *Index Bibliog.*, **7**, 1943-44, p. 1041.) Discusses the origin of mildew; mode of formation and of operation (attack on cellulose, wool, and silk); factors accessory to development; its detection; preventive measures.

540. Microscope: Applications in Cotton Research. By T. L. W. Bailey, Jnr., and M. L. Robins. (*Text. Res. J.*, **15**, 1945, p. 1. From *Summ. Curr. Lit.*, xxv., **9**, 1945, p. 212.) Applications of the microscope to the study of the structure of cotton fibres, yarns and fabrics, the effects of various treatments on them, and the penetration of sizes, finishes and proofing agents, are described. Photographs of the Hardy hand microtome and photomicrographs of cotton fibres and yarns, cross-sections of a rayon-cotton mixture fabric, a yarn stained to show starch sizing, acetylated and deformed fibres, chemically treated yarns, yarns showing penetration of the preservative for rot-proofing, unstretched and wet-stretched tyre cord, and tyre cord with adhering rubber, are presented and discussed.

541. Photography: Application to Textile Research. By C. W. Bradley. (*J. Soc. Dyers and Col.*, **61**, 1945, p. 61. From *Summ. Curr. Lit.*, xxv., **11**, 1945, p. 262.) An account is given of ordinary, stereoscopic, fluorescence and infra-red photography, cinematography, and high-speed motion photography, as applied to textile research. Photo-micrographs of a portion of a cotton seed with developing hairs, rayon velvets, and damaged cotton fibres, photographs of a Shirlan-treated fabric in ultra-violet light, and of camouflage materials taken by visible and by infra-red light, and high-speed spark photographs of a shuttle at different times during its traverse across the loom, are presented and discussed.

TRADE, PRICES, NEW USES, ETC.

542. Cotton Trade: Competition. By Sir E. Raymond Streat. (*Text. Merc. and Argus.*, **112**, 1945, p. 281. From *J. Text. Inst.*, May, 1945, A235.) A report of an address on the way competition affects the cotton trade in respect to (1) rivalry between cotton-growing countries, (2) alternative use of cotton, and (*a*) other natural fibres, (*b*) rayon, or (*c*) non-textile materials, (3) international rivalry, and (4) rivalry between firms within a national industry.

543. Textile Industry: Prospects. By G. J. Esselen. (*Text. Res.*, **14**, 1944, p. 410. From *J. Text. Inst.*, May, 1945, A236.) The effect of war on the textile industry, probable future competition from paper and plastic products, and opportunities for new developments in fabrics for laminating purposes, in the production of finished webs without the use of elaborate weaving machinery, and in new surface coatings, are discussed. It is pointed out that it is to the application of chemistry that the textile industry can probably look for the greatest improvement in the next ten or twenty years. . . . The advantages that can be derived from the application of statistical analysis are indicated. It is suggested that industry is on the threshold of many new developments which, if properly received and utilized, should result in the renaissance of the textile industry. The importance of research is emphasized, and the support of co-operative research, the establishment of research and development divisions in individual mills or groups of mills, and the use of consulting organizations are urged.

MISCELLANEOUS.

544. British Cotton Industry Research Association Fellowships. (*Nature*, 18/8/45, p. 200.) The Council of the British Cotton Industry Research Association has decided to make an annual award of a limited number of research fellowships with the object of training young men in research methods in pure science, and particularly those branches of prime interest to the Association. The Association conducts research into the utilization of cotton, rayon, silk, and synthetic fibres, and examples of scientific fields of present interest to the Association are: carbohydrate and protein chemistry; fundamental studies of high polymers; photo-chemistry; fundamental physical studies relating to properties of matter or electronics; theory of instrumentation; mathematics; studies on the colloidal state. The fellowships will be open to graduates of British nationality and will be tenable at any British university. Their value will depend on circumstances, but will not in any case be

less than £200 per annum. The Association will be guided in its choice of the location of fellows chiefly by the type of research conducted by the professor under whose direction the candidate elects to work. Application for election to a fellowship should therefore be made through the professor and should be accompanied by a statement of the problem to be studied. It will be normal for the Association to wish to interview candidates, but the recommendation of the professor will be essential and will carry great weight in the selection. Applications should be forwarded to the Director, British Cotton Industry Research Association, Shirley Institute, Didsbury, Manchester, not later than two months before the commencement of the work.

The object of the fellowships being to train young graduates in fundamental research methods, they will not be awarded for specific problems in connection with industry. Further, the results of researches carried out with the assistance of a fellowship will be published from time to time in the scientific journals at the discretion of the professor directing the work, and if deemed by him worthy of such action. The only condition attaching to publication will be that suitable acknowledgment shall be made by authors of the receipt of a fellowship. Without in any way implying direction of or interference with the research, the Association would wish to feel free through its director of research to discuss progress with fellowship holders from time to time, and fellows would be given opportunities to visit the Association's laboratories, and thus become acquainted with the problems of the textile industries. Save in exceptional circumstances, the Association will not make more than two consecutive annual grants to the same person.

545. The Sir Walter Preston Scholarships and Research Fellowships Scheme. (*Cotton*, M/c, 7/7/45.) Textile Machinery Makers Ltd. have announced the establishment of a scheme for the furtherance of higher education and research in relation to the textile industries. The scheme provides in the first instance for the expenditure of the sum of £35,000 over a period of seven years, the administration of the funds being vested in a Board of Trustees appointed by Textile Machinery Makers Ltd. for that purpose. The object of the scheme is to increase in the textile industry in general and the textile engineering industry in particular, the number of those possessing the highest possible qualifications in technology and experience in research. To this end the trustees are empowered, within the limits of the funds at their disposal, to award a number of valuable scholarships and research fellowships to be known as "The Sir Walter Preston Scholarships and Research Fellowships" and tenable in the Faculty of Technology of the University of Manchester, or in such other University institution as they may from time to time determine. The scheme will come into operation for the University session commencing October, 1945, and applications should be addressed to S. H. L. Greaves, Textile Machinery Makers Ltd., 60, Huddersfield Road, Oldham, Lancs.

546. Organization of Industrial Research. (*Nature*, 3/3/45, p. 280.) A report of an address by Dr. R. E. Slade given at the London Branch of the Institute of Physics, of which the following are some of the main factors regarded as essential to the successful organization of industrial research. A laboratory of a manufacturing firm must be a well-run unit constituting an integral part of the firm's activities and in full sympathy with the industry. The ideal chemical research laboratory would consist of a director and an administrator with six section leaders, five having charge of researches and the sixth looking after services including the library, analytical department, and workshop. Probably the most efficient size of industrial chemical laboratory would have 60-100 university trained workers and up to 400 other workers. The director himself should be an experienced research worker and capable of inspiring the workers under him. Industry must be alive to developments which may take place in any of the sciences. A national central laboratory of scientific techniques should be set up. The cost of research is £1500–£3000 per annum per university-trained research worker employed, including assistants, mechanics, glass-blowers, and services. Those carrying out research should have authority to purchase equipment up to a reasonable sum. Great importance should be attached to the linking of the research laboratory to the utilization of the products by the consumer.

Reference was made to the work of the thirty research associations of Great Britain and to the method of linking research and industry employed by the Mellon Institute in America, where manufacturers may have a specific piece of work carried out by endowing a fellowship for a number of years. A discussion followed the address.

547. Skinner's Cotton Trade Directory of the World, 1945. (Pubd. annually by Thos. Skinner and Co. (Publishers), Ltd., London, Manchester, Bradford, New York, Montreal.) This is the twenty-second edition of this most valuable publication. In spite of war-time conditions, the customary revision of details, arduous under normal conditions, but infinitely more so in war-time, has been carried through in so far as has been possible. The revision of details covering enemy and enemy-occupied territory, as well as the recently liberated territories, has, of course, not been possible, and for this reason such countries have again been omitted from this edition. With the present issue a new feature has been introduced, consisting of a number of statistical tables relating to Raw Cotton, which will be of interest and value to subscribers. Owing to Government restrictions and prohibitions in most countries, many statistics which are available under normal conditions have not been issued due to the world-wide war. With a return to peace it is hoped to extend the statistical tables very considerably. The Trade Marks Section has been appreciably augmented. This is an alphabetical list of active Textile Trade Marks and Names owned principally by Companies listed in the Directory, including a considerably extended list of Canadian and United States Textile Trade Marks and Branded goods. The thumb holes, provided in the Directory for ease of reference, are labelled: Contents; Index; Exporters, Merchants; Spinners, Manufacturers and Doublers; Directors (British); Dyers, Finishers; Merchant Converters; Fabrics; Silk and Rayon; Hosiery and Knit Goods; Hosiery Yarn Spinners, etc.; British Trade Marks; Canadian Trade Marks; U.S.A. Trade Marks; Mill Supplies. All headings, indices, and explanatory notes are printed in English, French, German, Italian, Spanish, and Portuguese. The Directory is absolutely indispensable to all those concerned in any way with the cotton industry. The price by post, inland and abroad, is £1 10s.; Canada and United States, $7 (post and duty free).

ADDENDUM.

548. *Lygus simonyi*, Reut., as a Cotton Pest in Uganda. By T. H. C. Taylor. (*Bull. Ent. Res.*, **36**, September, 1945, p. 121.) Greatly increased attention has been, and is being, given to the effects on Uganda cotton plants of infestation with the Capsid bug *Lygus simonyi*. Although there is no reason to believe that these have become increasingly severe, their nature and seriousness have been more and more recognized until from some points of view the control of this pest seems the most important problem facing the industry. Being about to leave Uganda, Dr. Taylor, as the latest of a series of investigators occupied with Lygus, produced the present paper as a progress report of investigations which he regards as only providing the foundations for decisive work to come. Certain technical matters, including descriptions of allied species and enumeration of the plants which they frequent, are held over for separate publication.

Lygus simonyi, in common with other species, has a very wide range of food plants and of host plants, the latter being defined as those on which breeding takes place. The insect flourishes, though with strongly contrasted ecology, in both the elephant-grass and short-grass zones into which Uganda is customarily divided. *L. simonyi* attacks only the young and succulent tissues of the plant, notably young unopened leaf buds and minute flower buds. A leaf is liable to be attacked for a short time after it has unfolded, but becomes unsuitable for Lygus long before it is fully grown. When at a late stage of development growth stops in dry weather, both feeding and breeding cease. Leaf damage is relatively unimportant; damage to squares, resulting in shedding, is more serious, and damage to terminals, resulting in cessation of growth, is more serious still. An effect of primary importance to the plant breeder is that no plant exposed to Lygus can develop its normal habit of

growth. The course of the annual infestations in both zones is described. (*a*) *The Elephant-grass Zone*:—In the earliest months of the year when no young cotton plants exist, and the weather is dry and hot, the few individuals to be found are mainly adults widely dispersed on a variety of plants. The rains of March and April stimulate growth and rapid breeding ensues. About the middle of June gradual infiltration to cotton (mostly sown from May onwards) begins. Bulk hatching of eggs begins with July and damage reaches a peak at the end of July, when almost every plant in the May sowings is severely damaged. On the June-sown plants the attack is on the whole much less severe. Drastic biological control by two species of the Braconid genus *Euphorus* supervenes, and by the end of July parasitism is almost complete. (*b*) *The Short-grass Zone*:—Conditions early in the year are similar, except that trees and shrubs, not herbs, afford the main means of survival. Grain crops, *Eleusine* and sorghum, are general in this zone, and as they mature in April and May an enormous Lygus population develops upon them, little checked by parasites. When these crops are harvested in June-July mass migration takes place and results in heavy infestation of every cotton plot. There is no marked decline until October, when the cotton plants cease to be susceptible. No such control by parasites as that described for the long-grass zone occurs, for reasons not yet understood. *Control* :—The possibilities of control are discussed at length, but remain at present largely speculative. There are degrees of varietal susceptibility but nothing worth calling resistance. Hairiness, to be effective, would need to be of some type not yet available. Types of plant with predominantly monopodial growth would have decided advantages over the present sympodial type. There are possibilities worth examining of increasing parasitism in the short-grass areas. One of these is the adoption of sorghums with an open type of head, facilitating the access of parasites. The mass migration from grain might be checked or prevented by ratooning sorghum, avoiding simultaneous harvesting. A small north-western area of Uganda where this is the custom is the only part of the country where Lygus does little damage, and locally none whatever; it is suggested that the same custom may explain the absence of recorded damage in the Sudan. Delay in the sowing date of cotton offers a fairly certain means of avoidance, but is complicated as a practical measure by various other considerations.

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Editor of Review :
W. NOWELL, C.M.G., C.B.E.

Assistant Editor :
HILDA L. BARNES.

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THE EMPIRE COTTON GROWING REVIEW

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EDITORIAL

WE resume with this number the publication of the REVIEW in the form which was interrupted after the issue of October, 1939. We hope in this and subsequent numbers to bridge the gap in the descriptive records of the countries and institutions with which we are concerned. Cotton is a necessity in war as in peace and on the whole there has been no essential change in its production. Marketing has of course been dislocated, but this situation has in large degree been met by state action. Most interference has been caused by the increased competition of local food crops for the available land and labour. Experiment and research have been affected. The depleted staffs of agricultural departments and experiment stations have had to give much of their time to more urgent matters yet it is remarkable how much has remained. There has been no serious shortage of current material for the half-yearly abstract numbers we have continued to publish.

Notable progress has been made in more directions than one. We select for comment that which has perhaps the widest interest in its relation to colonial cotton-growing: progress in the study of sound agricultural practice in the East African Dependencies.

The policy of the Empire Cotton Growing Corporation has long recognized that cotton as a crop cannot stand alone. The growing of cotton to be permanent must be part of an agricultural system. Assistance in its development must take fully into account its relation to other crops and to the maintenance of the fertility of the soil. Particularly has it been recognized, since soil erosion began to attract attention, that cotton is apt to be a dangerous crop in this respect.

There can be no doubt as to the soundness of these principles, but many difficulties arise in their application. Native agricultural practice has many variations: determined by reactions to climate, soil and population as well as by the industry and aptitude of the tribes concerned. Based originally, and for the most part remaining based on shifting cultivation, the primary purpose is food supply. Quite recently, cash crops have been included in the system. (The further stage of growing cash crops for a living has not, in East Africa, been reached to

any significant extent.) At least, that is the general idea, but readers will learn, on later pages of this number, that in considerable areas of Tanganyika cotton is still grown as a thing apart, with no relation to the subsistence crops. The first step towards the realization of the policy described above has yet to be taken. The cultivator has been persuaded to grow cotton; he has not taken it to his heart.

Nevertheless, the earth does move. Five years ago the term shifting cultivation was still used widely, and subject to isolated protests, as a term of reproach. Such it admittedly remains, applied to the devastation of irreplaceable upland forest. But under the synonym of bush fallowing it is now becoming widely recognized that this system, and developments from it based on the same principle, afford over vast areas the only feasible means of conserving soil fertility and sustaining a permanent agriculture. Where the population is well distributed and there is land to spare, as is still the case over parts of Tanganyika, bush fallowing in its original form still serves its purpose as it has done for untold years. Where, as in many regions, changed conditions have brought increasing pressure on the land from the growth or concentration of population or from extensive use for export crops, the long periods of disuse entailed are no longer possible. Methods more economical of land are necessary.

Hope from the adoption of imported systems of rotation and manuring is much restricted, quite apart from the difficulty of securing their acceptance, even where the absence of tsetse makes possible the keeping of stock. The evidence of much recorded experience has been too often disappointing. It would appear that the rapid loss of humus in soils exposed to the African sun, assisted probably by the activities of termites (a subject on which far too little is known), seriously limits the duration of the effects of organic manures. They may be, and often are, effective on the crops to which they are applied, but their residual effects are small or wanting.

So far as this is found to apply, it seriously weakens the foundations of the case for mixed farming on small holdings, on which great hopes have been erected. This policy, in practice, has to meet other serious difficulties. African society has a communal, not individual, basis. Essential crops may be diverse, and the conditions for growing them not distributed so that a single holding contains them. Certain crops need organized protection. Not least, there is the fly that makes the keeping of cattle, but not necessarily agriculture, impossible over many thousands of square miles. To recognize this is not to say that mixed farming for the African is not a desirable thing, where it will work. It does indicate some of the limits to its application.

For most of the experience in the study of this important problem we have to look to the Department of Agriculture in Uganda, which,

largely owing to the early popularity of cotton-growing, has been long concerned with it. The obvious methods were tried first. The records are available of carefully planned and long continued trials of manures and systems of manuring. Still the soil deteriorated. We gather the impression that the more thorough the cultivation, according to European standards, the worse in the long run was the result. Small holdings were tried and the policy abandoned, owing to the difficulties indicated above.

A fresh start was made, this time from indigenous practice. It was possible that the resting period could be greatly curtailed and the area in cultivation correspondingly expanded if, instead of leaving the return of vegetation to thrown-out land to natural colonization and succession, a restorative cover were artificially established. Trials demonstrated that in the wetter zone elephant grass functioned well for this purpose. At a later date another grass, *Cynodon*, was found suitable for the drier short grass areas.

From the developed results as expounded and explained by Dr. W. S. Martin, the idea of the grass fallow, and by extension, fallow under other forms of controlled cover, has attracted wide attention during the war years.

In his exposition of the method Dr. Martin puts the greatest emphasis on the restoration of soil structure rather than of fertility in the narrower sense of the supply of plant food. The soils deteriorated under use have become powdery and are easily compacted. The lack of pore space hinders the absorption of water from rainfall, which runs off at an early stage and is lost. Any tendency to erosion is greatly increased. Much responsibility for this general result is attached to the disturbance and exposure involved in successive cultivations. The principal effect of the grass fallow, continued for two or three years, is in brief to restore the crumb structure of the soil, render it deeply permeable to water and to air, and so permit the healthy functioning of the roots of the succeeding crops.

There doubtless remains much to be learned about the process, especially in relation to the supply of plant nutrients, and there is, moreover, a wide field open for the comparison, under varying conditions of soil, climate and usage, of other plants or plant combinations with grasses. The grasses are found to vary greatly in efficiency among themselves, and certain shrubs have long been known and valued for the purpose by some native tribes.

Viewed as it stands and as a foundation for further work the method has the supreme advantage of being in line with local tradition. Its general adoption is for that reason far more likely than that of any unfamiliar innovation.

COTTON IN NYASALAND

BY

H. C. DUCKER,

Cotton Specialist, Empire Cotton Growing Corporation, Nyasaland.

THREE articles under the above heading have appeared in this journal (see "Cotton in Nyasaland," E.C.G.R., Vol. VI, No. 4, Vol. IX, No. 3, and Vol. XV, No. 3). These have given a general picture of Nyasaland conditions and the part played therein by the cotton crop. It is now intended to complete the picture as seen to date, after reviewing the history of Nyasaland cotton over the intervening period.

Crop results for the seven years which have elapsed since the third article was written have been as follows:

In bales of 400 lb. weight Lint.

	European (Mainly tenants)	*Native (Trust land)*	*Totals*
1938	2,650	14,708	17,358
1939	848	4,428	5,276
1940	843	5,683	6,526
1941	660	4,716	5,376
1942	1,905	12,487	14,392
1943	830	4,722	5,552
1944	1,340	7,110	8,450

Cotton grown by European estates with hired labour has continued to be negligible. Results from the 1945 crop are not yet available, but it is expected that they will not be greatly dissimilar from those of 1944.

The crop of 1938 was the second largest ever produced in the Protectorate, and since it is known that a considerable amount of seed cotton, estimated at 2,000 to 2,500 tons, was sold outside the country, the true total cannot have fallen far short of that of the record year, 1935, when 21,006 bales were exported. The causes of this satisfactory result were very favourable weather conditions during the planting season, enabling a maximum acreage to be sown.

A new system of marketing was introduced, which consisted of selling, by auction, the right and obligation to purchase all seed cotton brought to each particular market at the price bid per pound for the cotton which would come to that market. The selling price was based on three months "Futures" of American Middling at the time of the auction, and automatically increased or decreased for each rise or fall of twelve points in these future prices by one thirty-second of a penny per pound

seed cotton. The system worked well on the whole, marketing was simplified, buying costs were lowered, and the sellers received a better price in comparison with the market value of the cotton than in previous years. Unfortunately the increased returns did not satisfy the growers, who were further upset by the fact that higher prices than those obtainable in Nyasaland were paid in Portuguese E. Africa. Much seed cotton was therefore sold over the border, and in 1939 this dissatisfaction with prices resulted in a large drop in the number of growers. The corresponding drop in the crop may be seen in the table. The effect of the decrease in acreage was enhanced by increased bollworm attack, owing to the concentration of moths bred up on the large acreage of the previous year.

In 1939 came the war, and Governmental policy in respect of agriculture became a matter for continual review to meet changing circumstances. The first duty laid down was to produce an abundant and cheap supply of foodstuffs for the military and civil populations, and the second to maintain or increase production of economic crops essential to the war effort.

So far as cotton was concerned the effect of all the various factors at work was to render production relatively stable during the two years which followed, but better prices and favourable seasonal conditions resulted in a marked increase in number of growers and size of crop in 1942. In that year the changed economic conditions due to the war made it necessary to suspend temporarily the auction system of marketing, and local ginners purchased the crop by tender.

Uncertainty about the fate of the cotton market led to representations that Nyasaland be brought into line with the other E. African territories, and in 1943 purchases were begun under a guarantee obtained from the Ministry of Supply whereby the disposal of the Protectorate's crop for the duration of the war and for one complete marketing season thereafter was assured. This arrangement has had the effect of stabilising the price at levels which, though they might have given satisfaction had other crops received similar treatment, have not proved at all to the liking of the growers, especially in the Central areas where boom prices have rendered tobacco a strong counter-attraction.

1943 proved, moreover, to be a thoroughly bad year for cotton, and ravages by bollworm were such that the poorest crop, in size and quality, since that of 1939 was produced. 1944 showed some improvement but its crop only amounted to two-thirds of the 1942 harvest. As mentioned earlier, 1945 shows but slight change, but since it has been found possible to raise the guaranteed price there is more interest in cotton at the time of writing, and seed issues for the 1946 crop show some increase.

To explain the fluctuations in cotton production which have occurred over the past seven years, it is necessary to emphasize that the bulk of

the crop has continued to be produced by one area, the Lower River, and that yields there have a preponderating influence on returns.

The Nyasaland cotton areas were classified in the 1938 article into four groups, by elevation and by the type of crop grown. Of these, group 3 (see Vol. XV, No. 3, p. 205), with elevations ranging from 2,500-4,000 feet above sea level, had not emerged from the experimental stage. This group covers those parts of the country where tobacco is now the main cash crop, and in 1939 it was decided that the economic outlook was such that further work on cotton in these areas, particularly on the Lilongwe plateau, was not justifiable, for the time being at all events. It is still less justified now, since even in the next lower range of elevations, from 1,000 to 2,500 feet above sea level, usually termed the Central areas, cotton has been feeling the competition of tobacco and other crops, as the following table shows:

Native Production in Tons Seed Cotton, by Areas.

	Lower River	*Central Areas*	*N. Nyasa*	*Totals*
1939	1,357	1,255	242	2,854
1940	2,349	807	364	3,520
1941	1,477	1,062	362	2,901
1942	6,247	1,138	306	7,691
1943	2,245	814	352	3,411
1944	4,654	507	248	5,409
1945	Comparable with 1944.	Returns not yet to hand.		

This table covers the war years, and the effect of tobacco prices, and the returns obtainable from food crops, on cotton production in the Central Areas, is very marked.

The Central areas suffer further from the fact that in them cotton must be grown as a summer crop, planted as soon as possible after the break of the rains. This means that it competes directly with the essential food crops for the time and energy of the growers, and as a rule is neglected in their favour. Tobacco does not suffer in the same degree; it may be planted rather later than the food crops since it is a short duration crop.

The Central areas are potentially the largest cotton-producing areas in Nyasaland, but it is unlikely that they will be developed properly till the African native to this country becomes more of a farmer.

Agriculture needs to be highly systematised if rain-fed crops are to be successful in a single rains country with a monsoon of short duration like Nyasaland, and the native agriculture is still of the primitive subsistence type. It is only fair to add that instability of cotton prices over the past two decades has not encouraged the natives to stabilise their cotton acreage, at all events in the areas being considered above.

In N. Nyasa, on the other hand, the relative stability in the cotton

crop is noteworthy in demonstrating, from a native point of view, the advantages of a winter crop regime. Here cotton is planted at or near the end of the rains on lands, adjacent to rivers, which hold sufficient moisture to carry it through the dry season. Harvest is in the hot weather prior to the break of the following rains, which in N. Nyasa begin somewhat later than in the southern areas. Under these conditions cotton, so far from competing with the food crops, is actually complementary to them, since its uprooting and burning after harvest automatically clears the gardens in readiness for their planting. In addition, cotton, being a clean weeded crop, leaves the land in good shape for the crops which follow it. The advantages enumerated, and the fact that tobacco is not grown seriously in N. Nyasa, have obviated the ill effect of price fluctuations, and it is a matter of regret that the N. Nyasa cotton areas are limited in extent.

There are two limiting factors to N. Nyasa production; first, the small area of land naturally suited to winter cropping; second, the liability of this land to early flooding, which may prevent the whole crop being picked. In 1939, and again in 1944, heavy rain in the Nyika highlands caused the rivers to flood prematurely, and so resulted in loss of part of the crop. The solution to both these problems is to develop the area by flow irrigation. A simple weir where each river debouches on to the Lake plain would enable furrows to be led round the upper margins of each alluvial fan, thus increasing the area on which winter crop cotton may be grown during the dry season, and permitting the removal of the greater part of the gardens to land safe from premature floods.

The largest producer of cotton in the country, the Lower River area, was in 1938 approaching the climax of a series of floodings by the Shire River, which during the previous three years had been progressively inundating its most fertile lands. By 1939 much of the population had been forced to move on to land not usually cultivated in cotton, and in that year it was computed by the Department of Agriculture that 120,000 acres of the best land had been lost. This state of affairs was brought about by a rise in the level of Lake Nyasa permitting the Upper Shire to clear its channel of bars and other obstructions which had accumulated over the years, and to release water down the Rift Valley to the Lower Shire in vast quantities, unprecedented in past records. The Lake level still remains high, and the great flow down the Shire and consequent inundations continue unabated. This has resulted in the cotton industry of the Lower River changing over from a system in which the greater part of the crop was planted on flood land to one in which cotton is exclusively planted on dry land as a rain-fed crop. Herein lies the key to the difficulties which have arisen, and in particular to the fluctuations in yield per acre which have occurred.

The staff of the Corporation stationed in Nyasaland has carried out

an intensive survey of the cotton-growing areas in the country, and the work of the Insect Pest Control Section over the past six years has shown conclusively that the paramount cause for the wild fluctuations which have occurred in yield per unit area of Lower River cotton during the period under review has been loss due to depredations by the Red or Sudan Bollworm (*Diparopsis castanea* Hmps.), a pest which in Nyasaland seems to be entirely dependent on cultivated cotton for its survival. The entomologists have shown further that the life history of this pest is such that only by the adoption of a winter crop cotton-growing technique, or alternatively, an extreme form of summer crop technique, similar to those used in N. Nyasa and at the Domira Bay Experiment Station respectively, can the pest be controlled. These techniques permit, in the case of N. Nyasa a close season of at least four months, January to April inclusive, when no cotton is on the ground to provide food for the pest, and in the case of Domira Bay the close season is from August to November, a similar period of four months. The former close season is very effective, the latter fairly effective, in controlling the red bollworm.

The trouble in the Lower River area is that the growers have fallen between two stools, in that they adopted a planting technique which with the very long growing season possible in the area has been making any effective close season impossible. They have been, and still are, treating cotton as a catch-crop, planted after the food crops have been dealt with, and kept on the ground for as long as possible to obtain the problematical benefits of both a summer and winter crop regime. The vast majority plant what was termed "semi-summer cotton" in the 1938 classification of cotton areas, and the work of the entomologists has shown beyond all doubt that the two months' close season, November-December, which this practice permitted, is quite useless as a control measure. The situation is further complicated by the growers introducing a practice of mix-cropping cotton in standing food crops, which while relatively innocuous in a winter or near winter crop system is far from being so if adopted un-modified for rain-grown cotton.

In 1938 the complex factors affecting the Lower River were imperfectly understood, but the work of the past six years has clarified the situation, and has shown that any idea of a semi-summer crop technique must be abandoned if red bollworm is to be controlled.

The alternative recommendations made by the Corporation's entomologists are briefly as follows:

(a) a winter crop regime to be adopted similar to that of N. Nyasa: Plantings, April-May; Uprooting, November-December.

(b) a summer crop regime, similar in timing to that usually adopted by the Domira Bay Experiment Station: Plantings, December-early January: Uprooting not later than July 31.

These alternatives are, of course, mutually exclusive, since the essential feature is to provide a non-cotton period at times which militate most against the pest.

As a preparatory measure, should a summer crop be desired, a non-cotton year is recommended in order to reduce to a minimum the population of red bollworm, which, as mentioned previously, has no known alternative hosts in Nyasaland. If the winter crop is decided upon, cotton in the Lower River will have to become an irrigated crop, except in so far as flood control measures may release land at present inundated and previously suitable for dry season plantings. The land situation in the Lower River is such that should flood control measures prove impracticable, and it be decided that a summer crop regime is worth while, a certain amount of intercropping of food crops with cotton may still be necessary in the more densely settled areas. The cotton, however, must not be too much retarded by the food crops, and suggestions as to how this may be accomplished have been made by the entomologists in their report.

This report was published by the Nyasaland Government in July, 1945, with the following foreword:

> " This report has been considered by Government, and it is proposed to take the following action on the recommendations contained therein:
>
> (*a*) To arrange for a survey to be carried out by an expert to determine the possibilities of the reclamation of flood land in the Lower River Area with a view not only to adopting the late planting method of Bollworm control, but more especially to increasing generally agricultural production in that area.
>
> (*b*) If as a result of this survey the flood control method of Red Bollworm elimination should prove impracticable, the recommendation contained in the report for a non-cotton year in the whole area should be adopted, to be followed by the introduction of early cropping of cotton and the agricultural measures ancillary to this as advocated in the Report."

A study has already been made of the Lake Nyasa levels by an eminent hydrologist, and his report has been submitted to Government. This report indicates that the flow down the Shire river may be permanently stabilised by a barrage scheme on the Upper Shire near Liwonde.

The new survey planned for the Lower River will decide which cotton-growing technique may ultimately be adopted there, though it is by no means certain that new considerations may not arise before any action is taken to alter the present state of affairs. The native attitude towards

summer-crop cotton in the past is by no means a good augury for the fate of the second alternative accepted by Government.

Demands on the Corporation staff in Nyasaland arising out of the war conditions, and concentration of resources on the insect pest control studies have hampered in some measure plant breeding and agronomic studies. It has, however, been possible to maintain this work and even extend it in certain directions, which have been dealt with in detail in the annual progress reports.

Several most successful strains of cotton have resulted from work on E. African and other Upland types, though none has yet taken the place of the Crown Land Bulk U.4 mixture, which continues to give good yields, when the pests permit, of very readily saleable cotton. It may be noted that this bulk as grown in N. Nyasa under winter crop conditions consistently produces better quality lint than does the summer crop at the other end of the Lake, grown from the same seed stocks.

Three cottons of better quality than C. L. Bulk U.4 are now undergoing commercial trial and one or more may take its place in the post-war years. The type of cotton aimed at is one having a staple length of $1\frac{1}{8}$ inch to $1\frac{1}{8}$ inch full, not too coarse, and with a good ginning out-turn.

To conclude this article the classification of the Nyasaland cotton areas given in 1988 may be revised as under:

District.	*Elevation above sea level.*	*Type of crop.*	*Months in which* *sown.*	*harvested.*
1. Lower Shire Chikwawa comprising Lower River	200–500	Summer *or* Winter, not both	Dec.-Early January April-May	May-July September-November
2. N. Nyasa Karonga Lake Shore	1,600	Winter	April-May	September-November
3. All other Districts	1,000 upwards	Summer	Dec.-Early January	May-July

Future developments in Nyasaland will depend largely on the economic status of the cotton crop. Assuming that this remains favourable present knowledge should enable production to be placed on a sound agricultural basis and stabilised at as high a level as the potentialities of the country permit, but it must be emphasised that to achieve this level a marked improvement in agricultural practices and, quite certainly for optimum results, a considerable outlay of capital on river control works and irrigation, will be required.

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COTTON IN TANGANYIKA DURING THE PAST FIVE YEARS

BY

J. E. PEAT.

Empire Growing Corporation, Tanganyika Territory.

DESPITE all the difficulties arising from the war, considerable progress has been made in the past five years in assessing the relative importance of the various influences that make up the background to the growing of cotton in Tanganyika. Some of the unfavourable influences should, in time, be capable of amelioration, improving the average run of yields, and thus allowing a more stable industry than exists at present to be established.

The Cotton Areas: Cotton Production.—Annual production has varied considerably during the period, from over 70,000 bales in the best year to well under half this amount in the lowest year. This variation in production has been determined only partly by the ordinary natural influences—the weather, husbandry practices, pests and diseases —but over and above this, by war conditions determining the cotton acreage planted, by the pressure to plant food or other crops for supply purposes, and by the war demands on man power. Prices have been satisfactory, and the returns reasonably good when even moderate yields have been obtained.

The quality of Tanganyika cotton is fairly good, though it varies considerably from area to area. The best from the Eastern Province is comparable to much of the Uganda crop, and is of high grade. The best of the Lake Province cotton approaches the Eastern Province in length and strength, but generally is lower in grade. A large part of the Lake Province crop, however, is distinctly poorer, especially from the south of the Province. (It is very necessary to bear in mind that lint quality is determined largely by soil and climatic conditions, so that only to a limited extent can the standard of quality be raised by growing a better strain or by better husbandry, when growing conditions tend to be difficult.)

In 1941, the best year, production was over 70,000 bales, of which around 50,000 bales came from the Lake Province, and just over 16,000 bales of the remainder from the Eastern Province—centring around Morogoro and Kilosa on the Central Railway from Dar-es-Salaam to Lake Victoria and Lake Tanganyika.

About two-thirds of the Territory's cotton production comes from the Lake Province, and about half of this from the area immediately around Lake Victoria. Growing conditions in the Lake Province differ considerably from those of Uganda and the north end of Lake Victoria, and from those of the Eastern Province of Tanganyika, the other main producing area in the Territory. The rainfall is lower, and in many years there is a droughty period in the early life of the cotton plant. The soils are mainly granitic in origin, and are light, especially in the north of the Province. Where there is pressure of population on the land the soils are exhausted. Around the Lake shore the population in many parts is dense for light land. Cotton growing is essentially of peasant type, based on the hand-hoe. Any stable cotton development must depend on sounder use of the land than at present, with considerably more attention to building up and maintaining fertility. Without this the main concern of the people must be simply the growing of food.

The production of the Northern and Tanga Provinces varies somewhere around one-third of the Eastern Province production. Conditions and growing influences there can be considered as fundamentally similar to those of the Eastern Province. One station is to serve all these areas. (It is necessary to generalize in presenting a brief review, but the difficulties in doing so will be appreciated when one is speaking about conditions over thousands of square miles of territory, where the factors which influence growth may differ considerably in detail fifty miles away from any one chosen centre.) In the Eastern Province 70 per cent. to 80 per cent. of the cotton is native grown, the remainder is produced on Greek and Indian owned estates. Rainfall is heavier and the land more fertile than in the Lake Province. In addition, in the flat alluvial type areas lying below the hill ranges, from which about three-quarters of the cotton comes, the growing crop benefits from subsoil moisture; the remainder is produced from generally poorer and drier areas. Quite apart from the different pest position, therefore, growing conditions are very different from those of the Lake Province. There, on the exhausted soils, plant vigour is important to ensure a frame sufficient to produce a reasonable crop; but in much of the Eastern Province type of country plant growth tends to be sappy and lush. Pest attack is very serious; without this heavy toll of the crop yields would be high, but, as it is, only a fraction of the possible crop is reaped. It can be appreciated that any reduction in the amount of the crop taken by insects would increase production very considerably, with little extra labour or expense to the growers.

In the Eastern Province, production from the Rufiji and Coastal areas, where there are special growing problems, varies from about 1,500 to 4,000 bales. There is also a small crop from the Southern Province, which has its own special problems.

Cotton Cultivation.—Over and above the economic aspects, most of which cannot be influenced directly within the Territory, the building up and maintenance of a stable cotton-growing industry is very closely bound up with a sound agriculture, and the control or amelioration, where such is possible, of the adverse influences, such as pest attack, which affect the growing crop. In other words, stability depends largely on the yield per acre that the cultivator can get year by year, and of course the value to the cultivator relative to alternative sources of income. For the good of the community, and as part of the economic programme of the Territory, the native cultivator is urged to plant cotton each year. Nothing succeeds like success: as a generalization it might be said that the more the grower gets year by year for his cotton, the more interest he is prepared to take in it, and to allocate suitable soil to it. This is not so true in less developed areas, but it holds good in the more settled areas, and is likely to be emphasized with increasing development of a cash economy.

Seed cotton is sold by the grower to the ginners at licensed markets and buying centres at a price fixed by Government. At the opening of the season only the first-grade cotton is bought, the low-grade cotton is sold during the last few weeks of the season. Ginning is by roller gins. Economies would be effected if, instead of roller-ginning, saw-ginning (air-blast) could be used. Preliminary trials have been carried out on good-quality Eastern Province seed cotton, and the lint from the trials is being spun at the Shirley Institute If the results show that no harm has been caused to the lint, it would be even safer to saw-gin Lake Province seed cotton, which is lower in quality. There are, however, market prejudices which would have to be overcome before saw-ginning would be generally favoured, even if the test results prove entirely satisfactory.

Four officers of the Empire Cotton Growing Corporation have been seconded to the Agricultural Department during the war years, and the duties assigned to them have consisted principally of experimental work on cotton. It is now intended that in co-operation with the Department of Agriculture the Corporation should be responsible for the investigational work on cotton and on problems of husbandry connected with its cultivation and that of its rotation crops in the main cotton areas. Before the war, serving the Lake Province, there was an experiment station at Ukiriguru, 17 miles from Mwanza, the port at the south end of Lake Victoria, and another station at Lubaga, near Shinyanga in the south of the Province. In the Eastern Province the work was centred at Kingolwira, near Morogoro, where there was also a large peasant settlement scheme. For future working it has been decided to serve the Lake Province from an extended Ukiriguru, with sub-station work at Lubaga, and a scatter of satellite district plots throughout the

Province. The remainder of the cotton-producing areas, essentially the Eastern Province and the other cotton-growing areas akin to it, will be served from a station which is being developed at Ilonga, near Kilosa on the Central Railway, and likewise supported by a series of satellite district plots.

The Lake Province, Ukiriguru.—The Lake Province cotton-growing area is about 20,000 square miles, but the greater part of the cotton is produced from half this area. The people are cheerful and industrious, but, though they have native lore on soils and food crops, they could not be described as good agriculturists.

As over much of Africa, care of the soil—the prevention of its loss and the maintenance of its fertility—is the dominant need. There is a considerable cattle population, but manuring, which is well worth while, is generally done only under pressure from the Native Authorities, and then only sketchily. The crop wastes have all to be hand-carried to the cattle enclosures, and the cattle manure hand-carried back to the fields. This hand-carrying must be a brake on any extensive use of manure on the scale required. Food legumes are interplanted in the grain crops, and the cattle graze the wastes on the lands after harvest, thus returning a little to the exhausted soil.

In the north of the Province the soils, though deep, are mainly light, and where the population is dense and the people have been long in the area the soils are exhausted. Cultivation is on 5-foot ridges, approximately on the contour; they are split each season. Further south there are areas of heavier soils, but with flat cultivation erosion is more of a problem. In the new settled areas around Lake Victoria land is still in good heart, and very good crops of cotton are grown in favourable seasons. Here cotton growing is popular. There are areas of poorer soil where settlement is taking place, and other good soil areas to the south-east of the Province capable of settlement. Great areas are closed to occupation by tsetse fly.

Ukiriguru lies 17 miles from Mwanza in typical exhausted granite country. The population around is dense for the type of country. Native cotton in the area is very poor, consisting of small stunted plants yielding in some years for many of the growers under 250 lb. seed cotton per acre. On the Ukiriguru hill lands, however, with reasonable husbandry and the use of manure, yields around 1,000 lb. per acre are more typical.

One of the main duties of Ukiriguru, therefore, is work on soil fertility, testing practicable methods of putting something back into the exhausted light lands. The benefits from manuring are measured and so are the quantities that can reasonably be made either of yard manure or of compost. There are cultural and rotation experiments, and work has been started on the problems connected with the resting of

land—resting crops, fallows and grass leys. The last has necessitated the testing out of possible perennial local grasses. Similar work has been going on at Lubaga for the different soil conditions and requirements of that area.

At all times the growing of cotton as part of the farming scheme is encouraged, rather than, as tends to be the case at present, its growth as a cash crop, often year after year on the same land, and divorced from any farming system there may be. It seems advisable that a limit should be set to the number of years land should be cropped, and efforts be made to get the land rested, probably under perennial grasses, grazed by cattle under control at chosen periods. But all this has to be worked out carefully, and the implications understood, before definite decisions can be made, and before pressure can be brought to bear, when desirable, through the Native Authorities and Chiefs. Such resting of land would be more easily carried out in the newer areas, where the land is not yet down nearly to a poverty-bottom level, and where population densities are still reasonable. It is a very much simpler matter to prevent soil impoverishment than to restore fertility to exhausted soils. In the densely populated light soil areas the whole problem, in practice, will be very difficult.

The Lubaga type of soil is fertile, but powdery and shallow, and loss of soil by erosion is important. Rest under grass will probably be the main approach here also, restoring structure for a limited cropping period. But again the implications have to be worked out. Other areas of heavier soils should probably be treated similarly. At Ukiriguru cultivation is on 5-foot ridges, split by hoe each season. The ridges are tied by cross ridges at approximately 5-6-foot intervals. At Lubaga, and in the south and south-east of the Province, little ridging is practised as cultivation is on the flat; but there is increasing weight of evidence that on these soils also cropping on tied ridges would be advantageous.

Cotton breeding has to be related to the plant environment: the weather, the soils, and the pests. The quality of lint at present is determined somewhat arbitrarily by the requirements of the established market in India for East African lint. For the poorer run of conditions plant vigour is important. A good cropping style of plant is aimed at, but not an early quick-maturing type, as the cropping season from the end of November is fairly long, extending even to early July near the Lake. A high degree of jassid resistance is essential, since this pest causes heavy loss to the crop in some years. But the degree of hairiness required to confer resistance, associated with the fineness of lint required for an established market, is difficult to obtain in the present material available. This is the breeding problem. Hybrid material is now being tested, and ultimately a wider range of possible types from the Corpora-

tion's Central Station will have to be taken up. The standard ginning percentage is low: 30·75 per cent. is taken as the ginning percentage when working out the price formula. A small increase in this percentage would add considerably to the value of the crop without further effort on the part of the cultivator.

In the south of the Province stainer damage (*Dysdercus* spp. and *Calidea*) causes heavy loss in most years. The injury is mainly to the top crop. This has the effect of shortening the cropping season there—a season which already is shorter than that around the Lake shore—because in the south food crops are the first to be planted, whereas around the Lake shore cotton is one of the earliest crops. South and south-west of Lubaga stainer damage is so heavy that it precludes the growing of cotton; nearer the Lake the damage is much less serious, but varies from year to year.

In some years American bollworm takes a toll of the young forming crop; the incidence seems to be related to the time of flowering of such other crops as pigeon-pea and maize. On the poorer soils of the north of the Province, aphis can be very troublesome in the droughty spells. On the richer lands in the north Capsid (*Lygus*) causes loss, and in some areas in wet years this loss can be crippling. Blackarm may be a factor in some seasons, and this requires watching. It will probably be worth while adding blackarm resistance to any strain to be issued.

The immediate requirements in the Lake Province are attention to soil fertility and better husbandry, and a good jassid-resistant strain of cotton.

The Eastern Province and Areas akin to it: Ilonga.—A study of the growing crop at Kingolwira, where the pre-war work for this area was centred, and a survey of the conditions where the bulk of the crop was grown, showed Kingolwira to be not at all representative. The soil there is poorish, and the crop is dependent entirely on rainfall which in many years is badly distributed, compared with country situated more favourably in relation to the mountain ranges. Stainer damage also was very heavy. Survey and a critical assessment of the crop from this region showed that around three-quarters of the production, and probably the more stable portion, came from fertile alluvial-type soils of high moisture-retaining capacity lying below the mountain blocks. The growing plant here gets the benefit from the high-water table after the finish of the rains.

In the Northern and Tanga Provinces the soils are not alluvial, but good supplies of surface water are available and irrigation is possible in many places. Ilonga was chosen as the site of a new experiment station which would fairly serve all three areas, and this is now being developed.

On the alluvial-type areas growth can be good, and, given small

insect loss, yields could be very good indeed; in fact, however, in many years cultivators reap only a small fraction of the potential crop. Though the soil is generally fertile, attention has to be given to the prevention of sheet erosion, the maintenance of fertility, and good husbandry. Grass fallowing may well prove to be the best practice here also where land has been over-cultivated and otherwise maltreated; the correct approach requires working out.

For the region as a whole, however, the loss to the cotton crop caused by insect damage overshadows in importance other work on the crop. American bollworm is generally very serious, its incidence being probably related to the food crop succession; maize is extensively grown either as a pure crop or mixed with other grains. On the lush sappy growth, especially after loss from bollworm of the early crop, Capsid (*Lygus*) damage can be severe. Capsid incidence is probably related also to the food crop succession, as the pest feeds on many crops besides cotton. The length of maturity of the sorghum variety grown, and the time of planting, probably have a bearing on the extent of Capsid loss on cotton.* *Helopeltis* can also cause loss, and stainers, as in so many parts of Africa, add to the damage. The complex insect picture, varying as it does from year to year, is a serious one for cotton growing, but in spite of it cotton is a valuable crop and the principal export crop of native agriculture in the coastal area. There is great need for work which might lead to any easing of the position.

Plot work at Ilonga and the satellite district plots has already shown that breeding work will give returns. Free-cropping types of cotton set a better crop in spite of pest damage. There has to be a following up of these investigations—the greater or lesser attractiveness of cotton plant types to pests, and the final crop the various plant types are able to mature. A wider range of cotton types, even if they are not of immediate economic importance, will have to be tested, and later direct economic work will depend partly on what these tests show.

Under the comparatively easy growing conditions, lint from the Eastern, Northern and Tanga Provinces is of good quality. This is probably helped by the lesser strain on the plant, through pest attack allowing only a moderate crop to mature compared with what the plant is capable of carrying. As a result of the careful hand-picking of the seed cotton after harvest, the grade is exceptionally high, and the quality of the lint is an important consideration in the economic breeding programme. Unless the balance of market preferences and values with yield can be changed, at least the present standard of quality will probably have to be maintained.

The Future Work.—Taking the Territory as a whole, the general direction of the work, as it affects the growing of cotton, is relatively

* *Cf.* this Review, xxii, 2, p. 135.—Ed.

straightforward. Essentially there is the necessity of ensuring that cotton, as the most important peasant cash crop in the areas where it is grown, should be part and parcel of an improved agricultural system, rotated with the other crops in the holding, and not grown as a cash crop which is something apart. There is a direct interest for those concerned with the cotton crop in considerations that make for better husbandry. There are many aspects that require working out on the stations before there can be much approach to the people. The pest position requires considerable attention from many points of view, with an eye to the cropping programme as a whole—cotton as a crop in rotation, and in relation to the food crop range. The cotton breeding work must be determined largely by the material available, and ultimately should derive much benefit from strains and types from the collection at the new Central Station when this is established, and similarly all the pest and other work must be influenced by the results there obtained.

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PICKING CLEAN COTTON

BY

S. T. HOYLE.

Empire Cotton Growing Corporation, Nyasaland.

Most of the cotton in Nyasaland is picked by children from six to ten years old. Various experiments have been made at the Cotton Experiment Station to find out the method of picking clean cotton which best suits the local inhabitants. Several types of tins and bags slung from the shoulders have been tried without success. A permanent labour force could probably be taught to use a slung bag fairly quickly, but the local native children have found it awkward to use at first, and as most of them stay only a month or so at work there is no time for them to get accustomed to the slung bag.

By far the most satisfactory method tried is to pick into baskets which are placed on the ground a few feet ahead of the picker; the seed cotton being thrown into the basket. The picker is quite unhampered by carrying any bag for the seed cotton on his person, and as the local native usually follows this plan himself he has nothing new to learn. Using this method it has been found that a native child will pick 20-25 lb. seed cotton a day from an average crop. The ordinary native basket in the area round the Cotton Station is made of woven split bamboo, and is about 20 inches in diameter by 16 inches high. It has been found that when these baskets are moved forward along the row of cotton they are usually dragged along, with the result that a lot of trash and dry leaf falls into the basket of cotton from adjacent cotton bushes. In order to overcome this fouling of the seed cotton special baskets have been made 3 feet high by 18 inches in diameter, so that they are as high as most cotton bushes and little or no leaf falls into them. As such tall baskets are difficult for a child to carry on his head, a strip of rawhide has been put round the baskets so that a pole can be put through the loops and two children can carry one basket. A further modification introduced has been to grade the seed cotton in the field. The pickers are sent out in gangs of three, two carrying one tall basket and the third carrying one of the small baskets. All clean seed cotton is put into the big basket and stained cotton into the small basket, and it does not matter so much if some leaf does fall into the stained cotton. Picking and grading at the same time has reduced the amount of cotton picked per head to about 15 lb. a day, but the cotton is commercially clean and does not have to be graded before marketing. Another advantage of

Type of Basket Used.

using baskets is that the foreman in charge of the picking gang can see at a glance whether the grading of the cotton is up to standard. At the end of the day when the baskets are brought in for weighing a final check is made and the pickers of any cotton which is not graded well enough have to re-grade it before they are allowed to leave work.

A DAY IN THE LIFE OF A COTTON GROWER*

BY

B. K. KAUMI.

African Agricultural Assistant, Uganda.

One day, early in April last, Musa Musoke awoke in the night to hear the rain on the roof of his house. "At last," he thought, "the rain has come and I can complete the preparation of my new cotton plot."

Musoke was a cotton farmer in Uganda, and held about ten acres of land on the estate of a big landowner. He had already roughly prepared his new land, but dry weather had prevented his giving it the final digging before planting. Each year he opened up a piece of fresh land for cotton, and as this land always gave him the best yields he was anxious to get it planted as soon as possible.

Next morning, therefore, Musoke rose and woke up everybody in the house; they washed their faces, cleaned their teeth, etc., and after greeting one another all turned out to dig over a new plot. Musoke and his wife had two children, a boy and a girl, who were old enough to help them in the plots. While he and his wife dug, the children helped by collecting the trash and laying it in lines across the plot, so that it may not interfere with the later planting of cotton. The family worked steadily until about nine o'clock when they rested for a while and ate a little cassava and drank some tea.

While resting Musoke's wife discussed with her daughter the food for the day. Sweet potatoes and beans were decided upon for the midday meal, and plantains and meat for the evening meal. Accordingly when the work was resumed, the girl went off to dig up some sweet potatoes from the sweet potato plot, and to cut two bunches of bananas from the banana garden. Work stopped at about eleven o'clock, and while his wife and daughter busied themselves with cooking, Musoke decided that he would go to the market to buy some meat for the evening meal. While there, he saw some new digging hoes and bought one. He also remembered that his wife had been grumbling about her worn-out paring knife, and thought that as they were having bananas for the evening meal he had better buy one and take it back to her.

After eating their midday meal Musoke and his wife discussed the next day's work, and decided to push ahead with the digging of the cotton plot. By chance an Agricultural Instructor arrived at that time, being on tour in that area on early cotton-planting

* From *The East African Agricultural Journal*, Vol. XI, July, 1945.

propaganda. He was very pleased to hear that Musoke was already preparing his early cotton plot. He told him that he had arranged to give out cotton seed in a few days. They all walked round the plots, and the Instructor congratulated Musoke on the way in which he had interplanted his maize and groundnuts; the maize was in widely spaced lines with the thickly planted groundnuts filling up the space between. His beans, too, were looking well, but the sim-sim plot was spoiled by the dry weather. When they came to the coffee plot Musoke said that he was ashamed to show it. It was very weedy as he had had to neglect it owing to much work on his other plots. The Instructor understood, but suggested that if he had trash-mulched his coffee, he would not have had many weeds.

When they had returned to the house Musoke's wife offered the Instructor some tea. He accepted, and while it was being prepared he asked Musoke if he had seen the new farm which the local chief had started. Musoke had not, and the Instructor described how the chief had learned about strip cropping at an Agricultural Department farm, and had decided to try it on his own land. He made a little plan on a piece of paper showing how this method could be used on Musoke's land. He explained that strip cropping was intended to reduce erosion. This interested Musoke as his land was fairly hilly and during heavy rains erosion was bad. So after drinking their tea they both went off to visit the new farm of the local chief. Musoke was very impressed with the way in which the chief's land had been stripped. He saw strips of cropped land alternating with strips of grass land. He realized that these grass strips would stop erosion almost completely; but as he had already cleared his new cotton plots, and planted his spring crops he did not think that it was possible to follow his chief's example. The Agricultural Instructor agreed but suggested that he could make a start towards stripping his land by using lines of grass planted at twenty-yard intervals running across the slope. Musoke thought that that was a good idea, and, returning to his holding with the Instructor, they both together started to mark out the places where the lines should run. While completing the work, Musoke requested that if possible he would like to be shown how the grass should be planted in the lines. The Instructor agreed with pleasure but informed him that as they were going to witness a semi-final football match of the county competition and it was getting late, he would just demonstrate to them the planting method of the grass, and leave them to complete the work afterwards. While the planting was in progress, Musoke looked at his wife who happened on the scene and seemed rather doubtful of what was being done at that moment. He briefly explained what they had seen on the Chief's farm and how they had started the work that he had decided to try on their holding. Musoke's wife, having seen that the grass once

cleared off the plot was that which was being planted again in the marked lines on the same plot, turned a deaf ear to what was said in favour of the planted grass lines because she thought that the grass was to grow, and spread its seeds on the clean plots. Although he had carefully and clearly explained to her the uses of the grass lines, and how they have to be cut back and trimmed from time to time, yet she simply would not hear anything at the moment. However, having planted two of the lines, the party collected working tools and other things and returned home.

After preliminary cultivation Musoke lined out the plots in 3-foot spaces from line to line, using a marked planting rope for straightening the lines. He then started placing the remaining refuse on the plot between the lines across the slope in order to check erosion of the soil.

While waiting for another shower of rain, one day towards the middle of May, a village chief called at Musoke's home, and informed him that their senior chief had arranged for their village to be distributed with cotton seed on the following Monday from the local cotton ginnery that served the area. When the day arranged arrived he tied a gunny-bag on his bicycle carrier, and proceeded to the ginnery. At the ginnery they were grouped by their senior chief according to villages under the supervision of village chiefs. When their turn to be supplied with the seed came, they went near the godown in which the seed was stored. The senior chief commenced distributing the seed to each grower according to his previously cultivated area, having been duly checked up by village chiefs. The seed supplied was measured in a four-gallon tin, and for an acre a cultivator had to get one tin. The scale of the seed used was taken by Musoke and his fellow growers to be too small for their areas. Consequently there was a general complaint among growers on account of the seed supplied, for they were accustomed to planting several seeds per hole, which is simply a waste of the valuable seed. Some of them went as far as giving false numbers of plots in order to try to get more seed than that estimated for them. On that day, while on his way home, a heavy rain started falling which forced him to increase the speed till he arrived home half wet.

Very early on the following day, Musoke with the assistance of the members of the house collected the seed, light or worn-out hoes, knotted planting ropes, and went to the plot. Starting from the top of the plot they stretched the ropes across the slope along the open lines previously prepared. Then they commenced digging shallow holes at every foot, following the knots done on the ropes. The work of changing the ropes from line to line and sowing the seeds, which were to be planted up to a maximum of six seeds per hole, was easily and happily carried out by the children who were with them. After eight days, having observed that the seeds had germinated, he started filling up gaps by resowing the

seed, and continued doing so until the original plants were at least 1 ft. above the ground. When the plants were about 10 inches high, Musoke started thinning out to two plants per hole. The first weeding started four weeks after sowing, and that time it was done at the same time with thinning out, and the operation of refilling gaps.

Subsequent to the above operations the plots were weeded as often as was required to control the weed growth. At the same time the weeds, remaining stumps of trees, stems and roots of the grass were carefully replaced between the lines as an anti-erosion measure, but, as he learnt by experience that constant cultivation tends to reduce the soil to a fine dust, which is easily washed away during heavy rain, he always tries to keep weeding to a minimum.

Towards the end of June when the cotton planted in May was well over a foot above the ground, the spring crops grown on other plots were harvested. The plots were dug over, marked out, the maize, groundnuts and bean stalks, as well as other refuse, were arranged between the lines, planted with cotton, gaps resown, and plants thinned out in the same way as already explained above. The work, on the whole, experienced on each of these plots was easier compared to that on the newly cleared land. Preliminary preparations of land on one of these plots were completed early in July, and planted soon after the only shower received in that month. Due to dry weather, the remaining plot was not sown until August. Following his usual practice, the late cotton plots were interplanted with beans and groundnuts at the same spacing as cotton, immediately after thinning out plants.

Cotton flowering commenced in August, and was general on all plots during September, October and November. The bolls on early cotton started to ripen in October, and picking was done from that time until it was completed, on all plots, by the end of the following March. The picking of cotton involved the co-operation of all members of the family, and it used to be carried out at any time when cotton was quite dry.

Simultaneously with picking, by using two baskets some sorting of the cotton into clean and stained grades was done in the field, and these qualities were stored separately in corners of the sitting-room. Every morning when it was fairly dry, Musoke had to take out the previously picked cotton and spread it thinly either on a drying stand or mats. During the drying it is sorted further into both grades and finally stored.

In February, one day, after the opening of the cotton marketing season at about 1 p.m., after a long morning's picking, a son of Musoke's neighbour brought two letters to him. One was suggesting that he should buy the remaining leg of a goat which had just been slaughtered at a price of four shillings. Unhesitatingly he instructed his wife to get the money out of the proceeds of beer bananas which she had sold and to hand it to the boy for buying meat. The second letter was sent by a

local cotton agent informing him that the long-expected lorry was to call at his home at about 4 p.m. to collect part of the crop, as requested when he had gone to his home to get a further supply of gunny-bags. Immediately Musoke called up his boy and both packed cotton into bags hurriedly while the other members of the house and visitors were sitting under a shady tree completing re-sorting cotton.

Round about the time promised, the agent came in a lorry together with a group of his fellow growers. With their assistance Musoke started loading cotton on to the lorry. He then put on his coat, got a stick and note-book, and jumped on to the lorry, and off they went to Kikoma cotton ginnery. They met several growers there, grouped in two places, at a cotton-weighing scale, weighing their cotton, and being paid at the cashier's window. When cotton bags and bundles were taken off the lorry, each of them separated his cotton from other bags, and carried it near a scaleman, where Musoke stood waiting for his turn to have his cotton weighed. Just then the local Agricultural Instructor came to inspect cotton that had just been brought in. He ordered them to put the bags in suitable positions for inspection. The bags passed as clean cotton were allowed to be weighed, and those found carelessly sorted out were marked with a cross, and the owners instructed to do their work as required on the spot before it was weighed. Unfortunately one of Musoke's bags was not passed, and he had to re-sort it. On his return from re-sorting cotton he was called up by the agent to have his cotton weighed. There at the scale he took out a note-book in which he had noted the weights of bags at home, and commenced to jot down the various weights as they were announced by the scaleman and recorder in front of the growers of different tribes of Uganda and neighbouring countries. Musoke then obtained from the scaleman the receipts bearing the quantity of the cotton sold, and went to the cashier's window for payment. After checking up the money, Musoke waited for the lorry to return them to their respective homes. At about 6 p.m. the agent called up all the growers he had brought to return. Soon everybody collected his empty bags, salt, sugar, tea, hoes, and knives which had been bought from shops near the ginnery or hawkers, jumped on to the lorry and off to their homes.

When Musoke was dropped at his house, he took out his bicycle and went to the chief's home, where he paid the sum of Sh. 26/50 for Government taxes, and a further sum of Sh. 12 for tithes of the landowner. Having got tickets for the above taxes he returned home, took a bath, and then called for food. In the meanwhile, the outstanding debts of his neighbours and occasional hired field workers, whom he met at home, were paid up. After that dinner, which included plantains (*matoke*) and meat, was served. During dinner he related to the members of the family the incidents of the day, and the news that he had

heard related by his friends. Strangely he did not mention to his people, who were so anxious to know about the proceeds, the total amount of money received from the sales of cotton. In spite of that, at the close of the stories all his people congratulated him most warmly for the troubles through which he had passed, and then after a long and busy day everybody went to bed.

DEVELOPMENTS IN THE WORLD RAW COTTON SITUATION DURING THE 1939-45 WAR PERIOD

BY

DUDLEY WINDEL.

THE outbreak of active hostilities in Europe in 1939 and in the Far East in 1941 profoundly affected the whole world economy. Production of raw cotton was not greatly disturbed as the principal cotton-growing areas were outside the spheres of military conflict, but consumption underwent many important changes through the dislocation of international trade.

APPROXIMATE PRODUCTION OF COMMERICAL COTTON IN THE WORLD

AMERICAN IN RUNNING BALES, OTHER GROWTHS IN EQUIVALENT 478-LB. BALES—(000'S OMITTED).

Country	1938-39.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.
United States	11,600	11,400	12,300	10,600	12,600	11,200	11,900
India ..	4,600	4,400	5,000	4,900	3,800	4,600	3,200
Egypt ..	1,700	1,800	1,900	1,700	900	700	900
Brazil ..	2,000	2,200	2,500	1,800	2,200	2,700	2,200
Russia ..	3,800	4,000	3,000	2,500	2,300	2,500	2,500
China ..	900	700	900	1,000	1,000	900	800
Other Countries	2,900	2,900	3,000	3,000	3,200	3,100	3,200
Total ..	27,500	27,400	28,600	25,500	26,000	25,700	24,700

Production of raw cotton in the United States during the war years held remarkably constant in spite of a steady downward trend in the planted acreage from 25,018,000 acres in 1938 to 20,472,000 acres in 1944. The decreasing area sown to cotton was about offset by a rising average yield per acre arising out of better cultivation.

Indian harvests were fairly well maintained until 1944-45, when a serious shortage of foodstuffs necessitated a drastic changeover of cotton land to cereals.

Egyptian cotton production held steady up to 1942-43, when the Government enforced a drastic cut in the acreage to relieve the growing scarcity of foodstuffs.

Brazil's cotton harvests during the war period averaged above those in the immediate pre-war seasons, due to better yields per acre in the Southern States.

Cotton-growing in both Russia and China was adversely affected by the hostilities. No official statistics of production have been made available since 1939 and the figures given are based on private estimates.

Production of cotton in the minor producing countries was well maintained, except in British East and West Africa and Australia. The following table shows the outturns of British Empire crops since 1938-39 as estimated by the Empire Cotton Growing Corporation:

(In Bales of 400 lb.)

Country.	1938-39.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.
Anglo - Egyptian Sudan ..	331,104	292,706	319,682	295,107	354,109	220,961
Uganda ..	303,893	296,672	368,898	236,370	112,849	191,870
Kenya	9,976	11,622	15,094	12,269	5,453	6,330
Tanganyika ..	64,106	65,314	72,766	51,017	38,309	
Nyasaland ..	5,276	6,526	5,376	14,392	5,552	8,450
N. Rhodesia ..	77	68	78	75	39	20
S. Rhodesia ..	82	408	433	1,938	1,464	1,657
Union of South Africa and Swaziland ..	747	2,061	1,857	854	584	664
Nigeria	24,057	50,632	73,295	36,119	32,494	24,786
Gold Coast ..	5	6	17	20	30	137
Cyprus ..	1,705	1,735	722	1,589	1,661	1,341
Malta	28	27	—	—	—	—
Ceylon	196	261	452	430	46	11
Queensland ..	15,457	10,319	14,296	12,312	8,364	7,366
Fiji	7	45	38	—	—	—
West Indies ..	5,636	8,492	9,312	7,450	4,555	4,099
Total ..	762,352	746,894	882,316	669,942	565,509	

It will be noticed that the trend of Empire cotton production turned downwards in 1941-42. This was largely due to natives in Uganda, Kenya, Tanganyika, Nigeria and the Southern Sudan turning over cotton land to meet the increasing need for domestically-grown food crops.

World Raw Cotton Consumption.

The war period resulted in a virtual blackout of consumption statistics in all the belligerent countries, so that the following estimates can be taken as only very approximate for Europe, China and Japan.

The following statistics are sufficiently accurate to give a broad picture of war-time world consumption trends. It will be seen that the big decline in consumption in Europe, China and Japan was partially offset by increased consumption in the United States, India, Brazil and certain other countries (notably Argentina).

APPROXIMATE CONSUMPTION OF COMMERCIAL COTTON IN THE WORLD

AMERICAN IN RUNNING BALES. OTHER GROWTHS IN EQUIVALENT 478-LB. BALES—(000'S OMITTED).

Country.	1938-39.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45
United States	6,800	7,800	9,700	11,200	11,100	9,900	9,600
United Kingdom ..	2,700	3,000	2,100	1,700	1,600	1,700	1,600
Continent ..	9,300	8,200	5,300	3,700	3,700	3,600	3,500
India ..	3,000	2,800	3,300	3,800	4,000	4,100	4,200
China ..	1,900	1,600	1,500	1,000	900	800	700
Japan ..	2,600	2,600	1,600	800	700	700	600
Brazil ..	600	700	700	800	800	900	900
Canada ..	300	400	500	500	400	300	300
Other countries	1,200	1,300	1,800	1,900	1,900	2,000	N.A.
Total ..	28,400	28,400	26,500	25,400	25,100	24,000	—

World consumption of commercial cotton divided between American and Other Growths during the past seven seasons was approximately as under:

APPROXIMATE CONSUMPTION OF AMERICAN AND OTHER GROWTHS

AMERICAN IN RUNNING BALES. OTHER GROWTHS IN EQUIVALENT 478-LB. BALES.

Season:	1938-39.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.
American ..	11,300	12,900	11,900	12,200	12,300	11,100
Other growths	17,100	15,500	14,600	13,200	12,800	12,900
Total ..	28,400	28,400	26,500	25,400	25,100	24,000

The above figures show that the contraction of world consumption during the war period was confined to "Other Growths" as consumption of American in the aggregate exceeded production.

WORLD STOCKS OF RAW COTTON.

Total world production from 1938-39 to 1944-45 exceeded world consumption by about 4,500,000 bales, so that world stocks over the period increased by this amount. Stocks of American declined by around 2,000,000 bales, but stocks of other growths increased by over 6,000,000 bales, mainly Brazilian, Egyptian, Indian and Argentine cottons.

APPROXIMATE WORLD STOCKS OF RAW COTTON

AMERICAN IN RUNNING BALES. FOREIGN IN EQUIVALENT 478-LB. BALES—(000'S OMITTED).

Countries.	1939, *July* 31.	1945, *July* 31.
Producing countries		
United States	13,300	11,100
India	2,100	3,900
Egypt	200	1,700
Brazil	700	3,700
Argentina	100	600
Other Producing Countries	2,000	2,700
	18,400	23,700
Importing Countries		
United Kingdom	900	1,700
Continent	1,400	500
Other Importing Countries	700	300
	3,000	2,500
Afloat	600	300
Total	22,000	26,500

These rough statistics reflect the war-time accumulation of stocks in India, Egypt, Brazil, Argentina and in certain minor cotton-producing countries. They also show the marked reduction in stocks in consuming countries, particularly in the European Continent and in Japan. United Kingdom stocks, on the other hand, show a substantial increase, due mainly to liberal imports of United States Lend-Lease cotton during the latter war years.

THE IMMEDIATE POST-WAR SITUATION.

On present indications, world production of raw cotton in 1945-46 will be only about 22,500,000 bales, due to much smaller crops in North and South America and India. World consumption, however, will probably exceed 25,000,000 bales this season owing to the resumption of activity by the mills of Continental Europe, China and possibly Japan. There would seem every probability therefore that the war-time increase in world cotton supplies will quickly disappear, especially in face of the enormous unsatisfied world-wide demand for textiles.

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NOTES ON CURRENT LITERATURE

COTTON IN INDIA.

1. INDIAN COTTON. (*Int. Text.*, **12,** 1945, p. 93.) The reconversion of the economy of India to a peacetime basis is not entailing any slackening of industrial activity because of the large accumulation of civilian needs; especially is this true of the textile industries. The reduction of cotton textile orders for the Defence Services last July was expected to increase civilian supplies by about 2,700 bales of cotton. The Secretary of the Department of Industries and Civil Supplies is also reported to have forecast a reduction of exports, beginning in 1946, again with a view to increasing supplies for civilians. Despite the fact that the Government instituted a cloth-control plan over two years ago, supplies still remain inadequate in the face of keen demand. Since the outbreak of war the Indian cotton mill industry has increased its production to a total of 4,800 million yards per annum, whilst a further 1,500 million yards were being produced on small power looms and hand looms. If this entire production is made available for civilian consumption it will ensure a per caput distribution of 15·75 yards annually, compared with the pre-war consumption of 15-16 yards; as a result of an increase in the purchasing power of the consumer and the relative general prosperity, however, the current per caput demand for cloth is about 25 yards per annum.

The Rationalization and Standardization Sub-Committee of the Textile Control Board has submitted the following proposals—to which the Indian Government has agreed in principle—for increasing the output of cotton cloth in India: Drastic reduction in the number of varieties of cloth and yarn produced by the mills; utilization of the maximum available productive capacity for manufacturing "utility" cloths (dhoties, saris, long cloth, coatings and shirtings); and drastic reduction in the production of all cloths that are wasteful of yarn.

2. INDIAN COTTON CONTRACT: OPERATION. By K. R. Marfatia. (*Ind. Text. J.*, **55,** 1945, p. 611. From *J. Text. Inst.*, xxxvi., **11,** 1945, A454.) Experience of futures trading under the new Indian Cotton Contract of July, 1942, is reviewed, and modifications necessitated by the buying policy of the Government of India are discussed. The main features of the amended contract now operating are set out under eighteen headings, dealing with the basis, grades, staples, premiums and so forth.

3. INDIAN COTTON INDUSTRY: ORGANIZATION. (*Ind. Text. J.*, **55,** 1945, p. 230. From *J. Text. Inst.*, xxxvi., **10,** 1945, A450.) The Indian cotton industry is said to include about 400 mills with more than 10,030,000 spindles and 200,000 looms, consuming 4,800,000 bales of cotton and employing more than 500,000 people. In 1941-42 the mills produced 4,494 million yards of cloth. To maintain this "flourishing state" after the war the writer considers that some measure of rationalization is necessary, but strongly condemns a proposal to float an all-India organization embracing all the mills in one combine.

4. OFFER OF RESEARCH FELLOWSHIPS. (*Ind. Text. J.*, **55.,** 659, 1945, p. 856.) Research fellowships in chemistry, physics and biology, to the value of Rs.3,36,000, have been offered to the National Institute of Science of India by Imperial Chemical Industries (India) to encourage the advance of science and to help the country's general prosperity. The fellowships will be available over the next five to seven years. Each fellowship is to be worth Rs.400 a month, and will be tenable for two years, with the possibility of extension to three years. In addition, a grant for research expenses will be made to holders who need special apparatus and materials.

The fellowships will be open to persons, irrespective of race, sex or religion, under 35 years of age. The overriding qualification for membership will be scientific ability.

5. Indian Central Cotton Committee. (*Ann. Rpt.*, 1943-44.) In the twenty-third annual report, recently received, it is stated that throughout the period under review the research and other activities of the committee were well maintained, and in some cases expanded, despite increasing difficulties arising from war conditions. Thirty research and twenty-two seed distribution and extension schemes financed by the committee were in operation. The various Acts passed for the regulation of transport, marketing, ginning and pressing of cotton, and the prevention of the introduction of foreign cotton pests, continued to function satisfactorily throughout the year. Investigations were continued on the following pests and diseases: black-headed cricket, bollworm, jassid, stem weevil, and *tirak* and wilt diseases. At the Institute of Plant Industry, Indore, good progress was made with the work in connection with cotton genetics and plant breeding, physiology, field-plot technique, seed multiplication and distribution. The year under review also witnessed an appreciable increase in the activities of the Technological Laboratory, Bombay.
[*Cf.* Abstrs. 201 and 299, Vol. XXII. of this Review.]

6. Indian Central Cotton Committee. Half-Yearly Meeting, 1945. (*Ind. Text. J.*, lv., 659, 1945, p. 785.) The half-yearly meeting of the committee was held from July 23 to 28, 1945. The most important subject under consideration related to the question of floor and ceiling prices of cotton for the ensuing 1945-46 season, and a resolution was passed urging the Government of India to raise the floor prices for all varieties of cotton for the 1945-46 season by Rs.50 per candy over the 1944-45 floor levels. Other matters discussed at the meeting included the proposed international agreement for the production and export of cotton; the possibility of increasing the use of Indian cotton in Indian mills; the probable competition from synthetic fibres in the post-war years; the question of reversion to the pre-war number of lashings for cotton bales; and the desirability of having an annual census of stocks of cotton held by the trade. The annual progress reports on the work carried out at the Technological Laboratory, and on the various research, seed distribution and other schemes financed by the committee in the Provinces and States, were reviewed, and recommendations made regarding the future lines of work.

7. Indian Central Cotton Committee. Report of the Technological Laboratory, 1944-45. (Ind. Cent. Cott. Comm., 1945. Price 6 annas.) During the period under review the previous standard of the work of the Laboratory was maintained, and there was an increase in many of its activities. The assistance rendered to the various Agricultural Departments, not only in India but also in East Africa and the Belgian Congo, was continued. The total number of samples received for test was 1,685, compared with 1,514 received in the previous year; this constituted a record, and represented an increase of 11%. Brief accounts are given of the work carried out by the Spinning Laboratory, Technological Research, Fibre Testing, and Ginning Sections. 582 samples were spun during the year, compared with 601 in 1943-44. Four technological bulletins by Dr. Ahmad and other authors, six technological leaflets, and thirty-eight technological circulars were published during the period under review.

8. Spinning Test Reports on Indian Cottons, 1934-45. By N. Ahmad. (*Tech. Circs.*, Nos. 619-20, 622-24, 626-34, 636-42. Ind. Cent. Cott. Comm., 1945.) The circulars contain the grader's report and spinning test results for Cambodia Co. 2, Karunganni, 1940-45 seasons; Hubli Jayawant, 1941-45 seasons; Bagalkote Jayawant, Bailhongal Jayawant, P.A.4F. (Bahawalpur) 1943-45 seasons; 289F/K25, Farm Westerns, Karunganni (Sattur), P.A.4F. (Jhang), Suyog (Sef 8.1), Vijay, Wagad, 1944-45 season; the report of the Standards Committee and spinning test results for Bijapur, 1934-45 seasons; C.P. No. 1, 1936-45 seasons; Navsari, 1937-45 seasons; Sind Sudhar, 1938-45 seasons; Broach B.D.8, Cambodia Co. 3, 1943-45 seasons; LSS (Shahpur), Upland, 1944-45 season.

9. TECHNOLOGICAL REPORTS ON INDIAN COTTONS, 1944-45. By N. Ahmad. (*Tech. Circs.*, Nos. 621, 625, 635. Ind. Cent. Cott. Comm., 1945.) The particulars given include agricultural details, grader's report, fibre particulars, spinning test results, remarks.

Punjab-American 4F.—The improvement in yarn strength has continued. Suitable for 28's warp.

Jayawant (*Kumpta*).—Spinning performance has shown a falling-off in the last two seasons. Suitable for 32's warp.

Surat 1027 *ALF.*—Yarns inclined to be somewhat neppy. Suitable for 31's warp.

10. TECHNOLOGICAL REPORTS ON STANDARD INDIAN COTTONS, 1944. By N. Ahmad. (*Tech. Bull., Ser. A, No.* 62, 1944. Ind. Cent. Cott. Comm.) The usual agricultural details, grader's report, fibre particulars, spinning tests and remarks are given for each of the nineteen cottons tested. Five cottons showed a definite improvement over the last season, twelve gave practically the same performance, while two showed a falling-off. Improvement was most marked in Sind Sudhar S.G., V434 (Akola), Cambodia Co.2, Nandyal 14, and Karunganni C.7, and was not confined to any one Province, but appeared to have occurred specially in the southern part of the country. Little change was shown by Surat 1027 ALF, Wagad 8, Jarila, Sind Sudhar R.G., Sind N.R., P.A.4F., LSS, P.A.289F/K25, Mollisoni, Umri Bani, Gaorani 6, and Koilpatti 1. Two cottons showing a definite decline in spinning performance were Jayawant and Gadag 1, both from Bombay Province.

11. TECHNOLOGICAL REPORTS ON TRADE VARIETIES OF INDIAN COTTONS, 1944. By N. Ahmad. (*Tech. Bull., Ser. A, No.* 61, 1944. Ind. Cent. Cott. Comm.) The valuation reports of the Standards Committee and of the Special Appeal Committee and the spinning test results are given for varieties of cotton supplied by the East India Cotton Association, and the grader's report and spinning test results for varieties supplied by the Ahmedabad, Bombay, and Southern Millowners' Associations, and the Karachi Cotton Association Ltd.

12. COMBING OF INDIAN AND KAMPALA COTTONS. By N. Ahmad. (*Ind. Frmg.*, vi., 8, 1945, p. 369.) A brief account of an investigation carried out at the Technological Laboratory, Bombay, to test the suitability of Indian cottons, after a combing treatment, for some of the purposes for which foreign cottons have previously been used. An analysis was made of several Indian cottons in comparison with the African variety Kampala. Differential response of cotton varieties to combing was observed. Properties conducive to improvement in spinning quality with combing treatment were analysed, and results indicated that where combing machinery was available, suitable Indian cottons could be used in place of foreign cottons.

13. INDIAN COTTON CLOTH: ECONOMICS OF PRODUCTION. By V. G. Ramakrishna Ayyar. (*Ind. Text. J.*, **55**, 1944, p. 696. From *Summ. Curr. Lit.*, xxv., **20**, 1945, p. 473.) The costs of production of khadi (hand-woven) and mill cloth are discussed. Khadi is much more expensive than mill cloth and has a poorer finish, and the wages in the khadi industry are lower than in the mills. On the other hand, the production of one million yards of cloth would give employment to 30,000 labourers on khadi but only 117 in the mill. The choice for India appears to be wide employment and a slightly higher cost, or unemployment and cheaper goods.

14. THE ANALYSIS, GRADING AND UTILIZATION OF INDIAN LINTERS. By L. Thoria and N. Ahmad. (*Ind. J. Agr. Sci.*, xv., **1**, 1945, p. 7.) An account of an attempt to grade 39 samples of Indian linters of the 1938-39 and 1939-40 seasons by three different methods, with a view to evolving a quick and reliable means of grading Indian linters. The methods employed were (*a*) mechanical analysis, (*b*) chemical analysis, and (*c*) surface grading, and the results of the experiments are discussed in detail.

15. A REPORT TO THE GOVERNMENT OF INDIA ON SCIENTIFIC RESEARCH IN INDIA. By A. V. Hill. (The Royal Society, London, 1945. From *Pl. Bre. Abs.*, xv., **4**, 1945, p. 302.) This valuable report on the organization and application of scientific research in India includes references to biology and agriculture, and will be of considerable interest to all those interested in the progress of plant breeding in India.

16. Scientific Research: Organization in India. (*Ind. Text. J.*, **55**, 1945, p. 803. From *Summ. Curr. Lit.*, xxv., **23-24**, 1945, p. 560.) A report is given of the recommendations of an Indian Industrial Research Planning Committee. They include the setting up of a National Research Council, the building and equipping of national physical and chemical laboratories, and some specialized research institutes for food technology, metallurgy, fuel, glass, oils and paints, etc., and the creation of a National Trust of Patents.

17. New Strains for Old Crops in Bombay. Pt. I. By B. S. Kadam. (*Ind. Frmg.*, vi., **8**, 1945, p. 353.) A brief description of the genetic improvement of cotton in Bombay, with particulars of the fibre characters, yields, ginning percentage, and spinning values of new strains. The most successful strains evolved are Suyog in South Gujarat, 1-2 and 1-6 in Middle Gujarat, Wagotar (4-1) in North Gujarat, Jarila in the Deccan, and Jayawant in Khandesh. Reference is also made to the introduction of Gadag 1 in the Dharwar district.

18. Cultivation of Gadag 1 (Upland) Cotton. By V. C. Pavate. (*Ind. Frmg.*, vi., **3**, 1945, p. 112.) Gadag 1 cotton has been evolved since 1912 from a Dharwar-American variety introduced in 1830 by the East India Company. It has proved superior to the Dharwar variety and produces large hairy leaves, long fruiting branches, white flowers and big round bolls. It has a longer, stronger and more uniform staple, higher ginning out-turn, and is more resistant to disease. Methods of cultivation are the same as for Dharwar-American cotton. The Department of Agriculture has undertaken the multiplication and distribution of Gadag 1 seed, and it is aimed at covering 300,000 acres with the cotton. Premiums for the new cotton are paid to the cultivators.

19. Plant Breeding and Genetics at the Imperial Agricultural Research Institute, New Delhi. By B. P. Pal and S. Ramanujam. See Abstr. 132.

20. Studies in the Periodic Partial Failures of the Punjab-American Cottons in the Punjab. XIII, XIV, XV. See Abstr. 144.

21. Erosion in the Punjab, its Causes and Cure. A Survey of Soil Conservation. By Sir Harold Glover. (Civil and Military Gazette Ltd., Lahore. 1944. Rs.15.7; 23s. From the review in *Nature*, 12/1/46, p. 31.) The Punjab has been paying serious attention to its soil conservation problems during recent years, as well it might in view of the spectacular progress of erosion and the combination of circumstances all tending towards its acceleration—rapidly increasing population, increasing head of livestock, friable soils, seasonal and rather low rainfall. The book under review sets out to take stock of the position throughout the Province, to make it clear how great the losses have already been, to show what measure of success in counter-erosion work has already been attained, and, finally, to indicate how much remains to be done, and to suggest how it can be done. Two extracts may be quoted from the preface and foreword respectively to illustrate the keynote of the conclusions reached. "It is scarcely possible to exaggerate the danger of permitting it [soil erosion] to advance still further. The disease has been diagnosed and effective remedies have been prescribed. . . . Where the life of the whole Province is imperilled no individual can be allowed through selfishness or indifference to stand aside." "The success or failure of soil conservation measures will depend on the extent to which they enlist the assistance both of nature and of the humble tiller of the soil and the still humbler shepherd and goatherd." One-third of the book is taken up by a general review of the subject, beginning with a brief account of the country and of its soils, vegetation and climate. The causes of erosion are surveyed, with an interesting account of the local grazing practices that are clearly at the root of the whole matter, and require the closest study and most careful handling. Next come the effects of erosion, with a formidable array of the very real threats that hang over the Province if it does not reform its ways and put its house in order. The risks to the vital irrigation works, hydro-electric plants, and communications are well brought out, and would in themselves justify heroic measures. The latter two-thirds of the book are devoted to a more detailed account of the position in individual districts. This method of treatment

admittedly results in a good deal of repetition, but a useful purpose will have been served apart from the considerable value of these summaries as historical records. A further object of the book was to review the work of the newly-formed Soil Conservation Circle of the Forest Department at the end of its first quinquennium. The author—and presumably his influential sponsors writing preface and foreword—are satisfied that it has thoroughly justified its existence. Further planning is accordingly outlined, calling for more than doubling the present staff of fully-qualified officers, with subordinate staff in proportion. Having made it clear that the book is a valuable addition to the literature on the subject, the reviewer makes a few comments for consideration in any future reissue. Paper, shape and size could all have been better, and there is no map of any sort; a brief index would be more useful than the appendix, which has only a very slender connection with the rest of the book. Finally, it is suggested that the chapters on individual districts should be separately published, perhaps in rather more "popular" form, and distributed locally as freely as possible.

22. SIND. CONTROL OF SPOTTED BOLLWORM OF COTTON. By G. R. Sharma and L. R. Mahindra. See Abstr. 107.

COTTON IN THE BRITISH EMPIRE (EXCLUDING INDIA).

23. ASIA. CYPRUS: COTTON LEGISLATION, 1944. (*Ann. Rpt. Dpt. Agr.*, 1944, p. 8.) A Declaration under the Cotton Law, 1937, prescribed certain villages as segregated areas in which only the cotton variety "Coker 100" might be grown.

24. AFRICA. KENYA COLONY: THE KIKUYU LANDS: THE RELATIONSHIP OF POPULATIONS TO THE LAND IN SOUTH NYERI. THOUGHTS ON THE FOUNDATIONS OF FUTURE PROSPERITY IN THE KIKUYU LANDS. By N. Humphrey. MEMORANDUM ON POLICY IN REGARD TO LAND TENURE IN THE NATIVE LANDS. By H. E. Lambert and P. Wyn Harris. See Abstr. 76.

25. NYASALAND: COTTON INDUSTRY, 1943-44. (*Ann. Rpt. Dpt. Agr.*, 1944, Pt. I. Recently received.) On the whole the season was a fair one for the cotton crop, good cool season rains in the Lower River districts enabling a late crop to be harvested that was larger than in the previous year. The crop was again purchased under a guarantee given by the Ministry of Supply, whereby the disposal of the Protectorate's cotton was assured for the duration of the war and one year afterwards. As in the previous season, the cotton was handled and processed by Nyasaland cotton firms acting as agents for Government. In the event the Ministry of Supply did not require to take delivery of the lint, which was successfully sold by tender to local firms for export. The profits from these transactions, together with those made from similar sales in the previous year, are paid into the Native Development and Welfare Fund, and made available for the general benefit of the African community. Seed cotton was again bought in two grades at prices which remained fixed for the season and which were the same as in 1943, with the exception of Karonga district, where a premium of $\frac{1}{4}$d. per lb. was paid for the superior roller-ginned cotton. Prices ranged between $1\frac{3}{8}$d. and $1\frac{1}{8}$d. for Grade 1, which amounted to 85·67 per cent. of the total crop, and second grade was bought at one-quarter of the Grade 1 price. Approximately £50,000 was paid out to Trust Land cotton growers, four-fifths of this sum being received by the 34,000 growers on the Lower River. After the Protectorate's requirements for cotton seed had been met there remained a surplus of approximately 1,000 tons of first-grade seed, which was eventually sold to the Ministry of Food.

26. SOUTHERN RHODESIA. (*E. Afr. and Rhod.*, 8/11/45.) For the purpose of restoring land damaged by erosion, the farmers of the Mazoe Valley formed a committee a year ago to co-ordinate and direct the work of soil conservation. With two large tractors lent by the Rhodesian Government, one with a terracer and the other with a bulldozer, nearly 130 miles of contour ridges have been made, in addition to those which have been rebuilt.

27. South Africa: Cotton Industry, 1943-44. (*Rev. of* 1943-44 *Cotton Crop*. Received 1945.) Early planted cotton progressed well, and, although December was somewhat dry, early rains in 1944 and high temperatures helped considerably. There was very little pest trouble during the season.

28. Tanganyika: Wasted Rainfall in Relation to Crop Production. By J. T. Purvis. (*E. Afr. Agr. Jour.*, xi., **2**, 1945, p. 110.) The losses of soil, and consequently of those plant nutrients on which crop production depends, have seriously reduced yields in Tanganyika, and in many cases rendered further cultivation useless. This article deals exclusively with water losses which are part of, and give rise to, erosion. During the growing season of the crops, which coincides with the main rain season, water losses are due to (*a*) run-off, (*b*) transpiration by the crop, (*c*) evaporation from the soil, and (*d*) under-drainage. These are discussed in detail. Details are also given of the following methods recommended for water conservation: forests; grass cover; contour banking; tie-ridging; contour hedges; rain ponds; dams.

29. Population Problems of Tanganyika Territory. By C. Gillman. See Abstr. 77.

30. Uganda: Cotton Prospects, 1945-46. The report of the Dept. of Agriculture for the month of November, 1945, states that the first half of November was marked by dry weather in most areas, but during the last week to ten days of the month heavy rains were generally distributed, and, while these improved the condition of the later plantings, they caused some damage or deterioration to early plantings ripe for picking. The crop condition is good-average, but prospects have decreased slightly. In some areas there is a danger of disease and pests increasing in incidence following the heavy rain at the end of the month.

31. Cotton Export Tax. (*Crown Col.*, November, 1945, p. 799.) The export tax on cotton has been raised from 5 cents per lb. to a maximum, on a graduated scale, of 14 cents per lb. The Financial Secretary explained that this was necessitated by the prospect of a deficit which might reach £328,000 at the end of the current year. The only practicable means of raising this additional revenue was by raising the cotton export duty. The yield of the tax, which would be between £400,000 and £500,000 in a full year, would serve to tide the country over at least two critical years.

32. Research Work on Cotton, 1943-44. (*Ann. Rpt. Dpt. Agr.*, 1943-44. Received November, 1945.) The development by genetic methods of cotton strains resistant to blackarm was continued at Kawanda and Serere. In district trials, the markedly resistant B.181 gave the highest yields in the Eastern Province, notably in Usuku, where it proved in every way superior to the local variety S.P.84. In north-west Uganda, S.2103, a mass selection from N.17, out-yielded B.181. For planting in the 1944-45 season, B.P.52 was supplied to the whole of the South Central zone, and to the Madi section of the West Nile-Madi zone. X.3 mixture (B.P.52 and B.181) reached a further stage in the North Teso zone. The multiplication of mass selections from N.17 proceeded in the Teso segregation area and in Busoga. A series of trials on gap-filling at Serere and Ngetta led to no increase in yield. A substantial advance was made in the systematic study of the genus *Lygus*, its parasites, and their biological relationships.

33. AUSTRALASIA. Queensland Cotton Industry, 1943-44. (*Dalgety's Ann. Wool Review*, 1944-45.) The season generally was a very favourable one for cotton production, but difficulty was experienced in securing sufficient labour for the harvesting of the crop. The Women's Land Army assisted in getting the crop off, camps being established in the Dawson and Callide Valleys. The acute shortage of labour resulted in a considerable proportion of the crop being harvested by the snapping method and consequently a higher proportion of the crop was of the lower grades and classifications. The total disbursement to cotton growers for the season amounted to £190,069.

34. Cotton Industry, 1944-45. (*Queensland Agr. Jour.*, **61**, 5, 1945, p. 260.) Although the season generally was unfavourable for high yields, returns from early cotton plantings on new cultivations again showed the value of cotton in dairy farm

rotations in districts suitable for its production. It is clear, however, that for such rotations there should be provision for late-summer ploughing for cotton so as to conserve all the subsoil moisture possible, and also to ensure penetration of all autumn and winter rains. Where cotton was grown under such conditions in the previous season very good yields were obtained, considering the amount and distribution of the rainfall registered.

35. WEST INDIES. BARBADOS: COTTON SPINNING PLANT INSTALLED. (*Crown Col.*, December, 1945, p. 887.) Modern methods of cotton spinning have come to Barbados with the erection of a building and installation of the necessary machinery for an experimental plant. The finest type of Sea Island cotton is grown locally, and no doubt is felt that a very ready market exists for the finished product.

36. GRENADA: CENTRAL COTTON GINNERY. (*W. Ind. Comm. Circ.*, lx., No. 1173, 1945, p. 173.) The Legislative Council of Grenada has passed an Ordinance, No. 2 of 1945, under which there shall be established and operated by Government, in the Dependency of Carriacou, a Central Cotton Ginnery for the ginning of all cotton produced in the Colony or imported for that purpose.

37. ST. VINCENT SEA ISLAND COTTON. (*W. Ind. Comm. Circ.*, lx., No. 1173, 1945, p. 160.) In December, 1944, the Administrator of St. Vincent stated that the British Ministry of Supply had decided to pay an extra 2d. per lb. for St. Vincent Superfine Sea Island cotton in 1944-45 and 1945-46. The *Government Gazette* of June 19 announced that cessation of hostilities in Europe had not altered the position in any way, and cultivators could look forward to receiving 2s. 6d. per lb. for the entire white lint production of 1944-45 and 1945-46 crops. Hope was expressed that all concerned would bear in mind the Ministry's request for a crop in 1945-46 of at least 1,200 bales, and make every effort to increase production to this level to meet the requirements.

38. THE PRECISION OF YIELD COMPARISONS FROM SMALL PLOT TRIALS IN SEA ISLAND COTTON BREEDING. By H. L. Manning. See Abstr. 84.

COTTON IN THE UNITED STATES.

39. AMERICAN COTTON CROP, 1945-46. (*Cotton*, M/c, 26/1/46.) The U.S. Dept. of Agriculture reports that the American cotton crop this season will probably be the longest average length in staple but the lowest grade index on record. It is also the smallest cotton crop since 1921 and one of the latest crops on record.

40. UNITED STATES: PROPOSED CEILING PRICES FOR 1946 AMERICAN COTTON CROP. (*Cotton*, M/c, 19/1/46.) In regard to the intended "ceiling" price for the 1946 American cotton crop the Office of Price Administration has announced that the ceiling for $\frac{15}{16}$-inch Middling American Upland cotton is 24·09 cents per lb. for growers. This represents the current parity price, with allowance for transportation, plus a certain margin for likely advances in the parity between now and the year end. It was also stated that the differences for other grades and staples are based on the actual Government reported differentials on sales of cotton between August 1 and December 31 last year. The O.P.A., in making the formal announcement of the ceilings, said that if the price of cotton becomes stabilized before the harvesting season it might not actually be necessary to put ceilings into effect.

41. UNITED STATES SERVICE AND REGULATORY ANNOUNCEMENTS, OCTOBER-DECEMBER, 1944. (*S.R.A., B.E.P.Q., No.* 161, Washington, D.C., 1945. From *Rev. App. Ent.*, xxxiii., Ser. A, **9**, 1945, p. 286.) Since comparable infestations of cotton by *Platyedra gossypiella*, Saund., exist on both sides of the lower Rio Grande, a revision of Foreign Quarantine No. 8, against the introduction of this Pyralid into the United States, authorizes the importation under permit into four border counties of Texas of cottonseed produced and sterilized in specified portions of the State of Tamaulipas, Mexico, for milling and handling under the conditions that apply within the counties named. The importation of cottonseed hulls produced from seed originating in the same area of Mexico is also authorized, provided that the seed is sterilized during the ginning process and subsequently protected from infestation.

The area of the Imperial Valley, Mexico, from which cottonseed and cottonseed hulls may be imported into the United States under permit, is extended to include not only that part of the valley that lies in Lower California but also a small adjacent area in north-western Sonora. Their importation from any other foreign country or locality is still prohibited. The domestic quarantine (Quarantine No. 52) against *P. gossypiella* is also revised. Its provisions include authorization of the movement under permit of cottonseed produced in lightly infested areas of the United States to other areas provided that it has been heated to 150° F. and kept at this temperature for at least 30 seconds as part of the continuous process of ginning and subsequently protected from infestation. Cottonseed produced in a heavily infested area may be moved into adjacent lightly infested areas provided that it has been subjected to the treatment described and is subsequently heated to and kept at a temperature of 155° F. for at least 60 seconds in a separate plant or on arrival at a designated oil mill. Both heat treatments are to be carried out under supervision.

42. American Opening and Carding Departments: Organization. See Abstr. 156.

43. United States Textile Research Institute Laboratory. By W. B. Foulk. (*Text. Res. J.*, **15**, 1945, p. 190. From *Summ. Curr. Lit.*, xxv., **16-17**, 1945, p. 396.) An account is given of the adaptation of the 34-roomed Baker mansion at Princeton for use by the Textile Research Institute. The converted mansion will provide, in addition to library and office facilities, adequate laboratory facilities for 24 research workers.

44. Sunspots, Rainfall, and the Price of Cotton. By E. H. Misner. (*Cornell Univ., Dpt. Agr. Econ., A.E.* 476, 1944. From *Exp. Sta. Rec.*, **93**, 3, 1945, p. 251.) All forecasts made in this study are on the basis of information available before the period covered by the forecast. The sunspot number used is for the year preceding the one for which rainfall is used. The May, June, and July rainfall data are available the first week in August. A low sunspot number (below 40) indicated a dry year (less than 105 per cent. of normal) correctly 78 per cent. of the time—a ratio of 3 : 1. A dry year predicted a decline in the price of the New York December cotton future during August-December correctly 64 per cent. of the time (2 : 1). A high sunspot number of 40 or more indicated a wet year (105 per cent. or more of normal) correctly 56 per cent. of the time (3 : 2), but a wet year predicted a rise in the price of the New York December cotton future during August-December correctly 81 per cent. of the time (4 : 1). As an average, the sunspot prediction of a dry or wet season the succeeding year for May, June, and July in the Cotton Belt was correct 67 per cent. of the 54 years 1889-1942 (63 per cent. when less than 100=dry, 100 or more=wet). The prediction from rainfall of a rise or decline in price of the December future at New York during August-December was correct 70 per cent. of the time for the same period. A prediction that the New York December cotton future would rise in wet years and fall in dry years during August-December, and that in years when this prediction was wrong the July future during December-July would do just the opposite, was correct for 46 years, or 85 per cent. of the past 54 years—a ratio of about 6 right to 1 wrong. Based on anticipated sunspot numbers and, from these, the expected rainfall, it thus appears that some dry years may now be expected in the Cotton Belt; a dry year favours a good yield of cotton. An appendix tabulates the rainfall over periods of years for the corn belts of the United States and Argentina, respectively.

45. Development of Mildew-Resisting Cotton in the U.S.A. See Abstr. 160.

46. Arizona: Cotton Industry, 1942-43. (*54th Ann. Rpt.*, 1942-43. From *Pl. Bre. Abs.*, xvi., **1**, 1946, p. 32.) "Selection of New Mexico 1517, Santan Acala, Stoneville 4A and 2B is in progress. F_2 plants of the following crosses are under observation: Santan × New Mexico 1517, Santan × Stoneville 2B, Santan × Wilds No. 13, 1517 × Stoneville 2B, 1517 × Wilds No. 13, Stoneville 2B × Wilds No. 13, and D and PL12 × Wilds No. 13, backcrosses and selections of the parent varieties also being grown. Four of the parent varieties have been analysed for various aspects of quality. In hybrids involving Santan the F_2 plants showed good standing ability, particularly in backcrosses to Santan as the recurring parent. In backcrosses in

which 1517 and Stoneville 2B were the recurring parents the progeny had poor standing ability. In the programme of breeding long-staple cotton, F_3 progenies of the second backcross of Pima×Tanguis to Pima have been studied chiefly with respect to the qualities of the lint and seed weight, with the object of combining the length and fineness of fibre of Pima and the high lint abundance of Tanguis. The data suggest that if the finest cottons are to be produced with the desired seed weight, a lint percentage somewhat lower than that obtained from the coarse cottons must be expected. Progenies with strong fibre occur in both the fine and coarser fibred types. F_4 progenies are being grown for further selection and data of lint quality. Tests have shown that strength of fibre of the individual seed decreases as the length decreases."

47. Californian Cotton: Production and Local Consumption. (*Text. World*, **95**, 8, 1945, p. 92. From *Summ. Curr. Lit.*, xxv., **21**, 1945, p. 477.) An engineering report recommends the building of a spinning, weaving, and finishing plant with 15,000 spindles and 400 looms in the San Joaquin Valley, California. It would consume about 5 per cent. (8,000 bales) of the local Acala cotton. This has a staple of about $1\frac{3}{32}$ in., and though it tends to be neppy it will spin useful yarns if less severe opening and beating and lower card production are practised. The market for the planned mill and its versatility are discussed, and a list of the recommended manufacturing equipment is added.

48. Georgia: Cotton Variety Tests, 1942-44. By R. P. Bledsoe *et al.* (*Ga. Sta. Circ.* 147, 1945. From *Exp. Sta. Rec.*, **93**, 4, 1945, p. 428.) Of 11 cottons tested annually for three years in middle and north Georgia, Empire produced the highest yield and money value, but was followed closely by several Coker varieties. Coker Wilds produced the lowest average yield of lint, while ranking high in money value owing to current high premiums on middling grade long fibre. Empire, Coker 100 Wilt, and Coker 100 produced the highest average yield and money value in north Georgia tests, 1944. Coker 100 Wilt and Stonewilt were superior in yield and money value in tests 1942-44, conducted at three or four locations annually in the Coastal Plain. CCS 3720, Coker 100 Wilt 3 and 4, and Stonewilt 4 were the leading varieties in yield and money value in south Georgia (Coastal Plain) tests, 1944.

49. Cotton Variety Tests in the Yazoo-Mississippi Delta. By J. W. Neely and S. G. Brain. (*Miss. Sta. Bull.* 416, 1945. From *Exp. Sta. Rec.*, **93**, 6, 1945, p. 711.) Varietal comparisons in seven localities showed Stoneville 2B, Deltapine 14, and Bobshaw 1 to lead in money value; Wilds 16 ($1\frac{1}{4}$ in.) and Bobdel, Delfos 444, 531C, and 651, and Stoneville 2C ($1\frac{3}{32}$ to $1\frac{1}{8}$ in.) to have longest staples; and Bobdel, Delfos 531C, 444, and 651, and Miller, to be earliest. Wilds 16, Bobdel, and Bobshaw 1 were outstanding in fibre bundle strength; and Rowden (Roldo), Miller, Deltapine 14, Bobshaw 1, and Bobdel were superior in fibre length uniformity.

50. Mississippi Cotton: Mechanization of Production. By F. L. Gerdes. (*Text. Res. J.*, **15**, 1945, p. 320. From *Summ. Curr. Lit.*, xxvi., **1**, 1946, p. 1.) Mechanization of cotton production in the Mississippi Delta has resulted in an increase of production by over 45 per cent. on an acreage reduced by one-third. Flame cultivators are in use on virtually all plantations that operate mechanical pickers. To make the machine picking of cotton successful in every respect the development of efficient cleaning machinery for use at the gins is most important.

51. Byssinosis: Absence in Mississippi Cotton Industry. By W. L. Ritter and M. A. Nussbaum. (*J. Ind. Hyg. Toxicol.*, **27**, 1945, p. 47. From *J. Text. Inst.*, xxxvi., **9**, 1945, A392.) Byssinosis does not exist as a clinical entity among employees exposed to Upland cotton in the cotton industry in Mississippi.

52. Cottonseed Oil Mill Workers' Byssinosis: Occurrence. By W. L. Ritter and M. A. Nussbaum. (*J. Indus. Hyg. Toxicol.*, **27**, 1945, p. 47. From *J. Text. Inst.*, xxxvi., **10**, 1945, A452.) It is the custom in the cottonseed oil mills of Mississippi to weed out workers who complain of asthma. By searching among former workers the authors found 12 negroes who had developed the trouble, and on taking two of them to an oil mill both became asthmatic, one very severely. The twelve men were examined thoroughly without finding any characteristic or

suspicious changes, even by means of X-rays. At a mill, another group of twenty-six men who had been exposed to the dust for at least 20 years were also examined by means of X-rays, but no chest abnormalities were discovered. The conclusion was drawn that although byssinosis could not be established as a clinical entity allergic persons may develop hypersensitivity to cotton dust and become asthmatic in the dusty atmosphere. The authors express surprise, however, at the absence of pulmonary signs in the X-ray picture. In actual fact there is more absenteeism in the rooms where the oil is expressed than in the dusty rooms. So far, no claim for byssinosis has been allowed in the United States.

53. Cotton Variety Tests in the Rio Grande Valley of New Mexico, 1940-43. By A. R. Leding and L. R. Lytton. (*New Mexico Sta. Bull.* 319, 1944. From *Exp. Sta. Rec.*, **93**, 5, 1945, p. 571.) Varietal comparisons, in which yields and other agronomic characters, as well as combed length of lint, strength index, strength of 22s yarn, and equivalent staple length were obtained, involved strains of Acala, Coker, Delfos, Deltapine, Meade, Stoneville, and Wilds. The data indicated that the present generally grown Acala 1519 variety is the most desirable for production under conditions of the Rio Grande Valley in New Mexico and the adjoining area in Texas, and that no change is currently advisable. Additional data on the 1944 test are presented in a supplement.

54. North Carolina: Cotton Wilt Control. See Abstr. 127.

55. The Relation of Staple Length to Grades of Cotton in Western Oklahoma. By J. D. Campbell. (*Curr. Farm. Econ.*, **18**, 5, Oklahoma, 1945, p. 111.) When cotton is snapped under conditions similar to those in Western Oklahoma short staples of $\frac{13}{16}$ and $\frac{7}{8}$ inch can be expected to make approximately one-half grade higher grade for the season than can be expected from $\frac{31}{32}$ inch staples. Similar relationships hold true for intermediate and longer staples. It appears that a decline of about one-tenth of a grade can be expected for each $\frac{1}{32}$ inch increase in staple length for common staple lengths under Western Oklahoma conditions for recent years. Grade and staple relations are only one of several variables that are involved in determining the most profitable variety of cotton to grow. Since price relations change between various grades and staples, revised calculations and estimates should be made with changes in prices.

56. Texas: Cotton Production Cost reduced through use of Mechanical Equipment. By H. P. Smith. (*5th Cott. Res. Cong. Proc.*, Dallas, Texas, 1944. From *Exp. Sta. Rec.*, **93**, 6, 1945, p. 780.) The author cites results of studies made on the operation of mechanized equipment in the production and final harvesting of cotton which by comparison with small inefficient farm equipment indicate that everything is in favour of the better mechanization. He holds that the Cotton Belt of the South can meet competition provided it takes full advantage of the opportunities to produce better cotton with maximum economy, but that there can never be maximum economy with small and inefficient mechanical equipment. Small machinery puts too narrow a limit upon the number of acres that can be worked by the labour now available.

COTTON IN EGYPT.

57. Egypt: Cotton Prospects, 1946-47. (*Cotton*, M/c, 19/1/46.) Cultivators are awaiting the Government legislation regarding the planting of the new cotton crop. It is considered probable that Government will take steps to restrict the area to be planted to long-staple cotton in Lower Egypt, but apparently difficulty is found in suggesting any alternatives; short-stapled cotton has proved unremunerative to growers in Lower Egypt, and medium staples, such as Giza 7 and Menoufi, have also proved unsatisfactory in the present season.

58. Egyptian Cotton, 1945. (*Cotton*, M/c, 10/11/45.) A report from the Alexandria Commercial Co., dated November 1, compares this year's cotton varieties with those of last year as follows: *Karnak* is fully equal in every respect, if not better. *Giza* 7 is rather shorter and more wasty, and having lost its original qualities will

probably be gradually replaced by Menoufi. *Menoufi* is very popular with spinners owing to its staple, which is much better than Giza 7, but not as long as Karnak. Spinners are advised, when possible, to purchase a small quantity of this cotton for testing purposes. *Ashmouni* is fully equal to previous crops. *Zagora:* the re-appearance of this variety on the market will be welcomed by Continental spinners. The few lots of new crop cotton which have arrived on the spot market have given full satisfaction concerning the staple and character of the cotton.

59. MEASURES TO CHECK DETERIORATION IN EGYPTIAN COTTON VARIETIES. By H. A. Hancock. (*J. Text. Inst.*, xxxvi., **11**, 1945, T267.) Part I. *The Giza Seed Maintenance System.*—Complaints of deterioration in spinning quality have referred to most of the world's cotton crops in recent times, and the control of deterioration is regarded as a major technical problem. In the seed maintenance system employed at Giza every propagation bulk is expanded from a single plant selected out of a selfed line. The progeny of this plant pass first through a purity checker, and are then expanded in wire gauze cages covering about half an acre, the aim being to minimize natural crossing. The seed is further expanded to become the renewal nucleus, from which all the commercial crop of that variety is ultimately derived. The nucleus is maintained at the centre of a large bulk of the same variety, propagation bulks from it being grown in surrounding zones, until there is seed sufficient to sow about one-sixth of the total commercial crop. Every three or four years a fresh renewal nucleus is expanded from another pedigree plant, a number of progenies being tested for yield and spinning quality, one only being selected. The possibilities in secondary selection are greater than was formerly realized, and improvement in a variety can often be achieved by a number of small advances. Impure seed in the commercial crop was formerly eliminated entirely on the basis of counts of off-type seeds, authority to refuse permission for sowing being granted under the Seed Control Law. For the long-stapled varieties, refusal of seed is now based on spinning tests; all the commercial crop of these varieties is grown directly from seed whose lint has passed the spinning standards, lot by lot. A system of elimination based on the date of commercial seed is under consideration.

Part. II. *Development of New Varieties.*—New Egyptian varieties were formerly developed from off-types found in old-established commercial varieties. Nineteen types given Giza numbers (one of them was Giza 7) were picked out of commercial Ashmouni, and a dozen improved types were also selected from the pedigree lines of other contemporary varieties. Much faster advances in plant breeding were made by changing to the hybridization method, pedigree plants being mated, and not plants from the partly deteriorated varieties from field populations. Selections from the hybrid lines were then again mated, and so on for several cycles, the populations being carried to successively higher economic levels by a process analogous to evolution. Strains with some economic character at a value beyond the limit formerly considered extreme are frequently found; there are now half a dozen varieties with yield above that of the highest yielding variety ten years ago, and the former upper limit for yarn strength is similarly exceeded frequently. Stress is laid on the possibilities inherent in secondary selection, and response to selection is ascribed to recombination of plus and minus modifiers in polygenic systems, on the lines suggested by " Student " and by K. Mather.

A short account is given of the effect of botanical research on agricultural economics. Changes in the varieties grown were formerly frequent and essential because the growers were unable to control deterioration; but changes are now made chiefly to exploit the more efficient production possible with new varieties. Stability will be reached when progress in research slows down, but only if the new varieties can be maintained without deterioration; and their evolutionary background has an important bearing on this question.

Part III. *Extent, Nature, and Causes of Deterioration.*—In extreme cases, deterioration in a variety led to a fall in yarn strength amounting to about 20 per cent. With Sakel, which was badly deteriorated at the end of its life, the yield and ginning out-turn did not change appreciably, but the staple became shorter, weaker, and

browner—a total result that could not be simulated by direct mixing of any combination of ordinary Egyptian cottons. Deterioration in general is ascribed to the dispersal of minor genes which can be regarded as the "wild-type" most suited to the environment and to the polygenic system operating. These minor genes, and certain major genes, have a strong selective advantage in varieties carried to a high economic level by human selection, in which the objectives are quite different from the objectives in natural selection. Any kind of impurity is apt to be seized upon by the crops for the promotion of their own ends. Deterioration reached serious proportions in Sakel and Sakha 4 owing to defects in the method of examination under the Seed Control Law. The off-types chiefly responsible for deterioration were indistinguishable from normal plants and seeds, but only those lots containing visible off-types were eliminated by operations, under the Law. The result demonstrated the extreme importance of methods for the detection and elimination of bad seed, because ample good seed was available although not in demand. Continuous attention has been paid at Giza to the initial purity of seed, and to its further protection; but seed cannot be kept pure in bulk, and increased attention is being paid to methods of elimination. Elimination of seed for the long staples is now based on spinning quality, and a Dated Seed System, to be applied to all varieties, is projected.

60. EGYPT'S COTTON-SPINNING MILLS. (*Cotton*, M/c, 2/2/46.) It is reported that there are now eleven cotton-spinning mills in Egypt containing 332,000 spindles, and with an annual production of 37 million kilograms of yarn. Mechanical weaving produces 160 million yards of cloth per annum. Handloom weaving, which has greatly increased during the war because of the impossibility of importing more machinery, produces annually nearly 50 million yards of cloth. As soon as the necessary machines and spindles can be imported, it is considered that Egypt will be able to meet her own needs except for certain high-class cloths which she is not yet in a position to produce.

61. SUMMARY REPORT ON THE WORK OF THE THIRD EGYPTIAN ANTI-LOCUST UNIT TO ARABIA. By M. Hussein. See Abstr. 100.

COTTON IN OTHER FOREIGN COUNTRIES.

62. ARGENTINA. SUBSTITUTION OF COTTON FOR JUTE IN THE MANUFACTURE OF BAGS AND SACKS. (*Bol. Mens. Junta Nac. del Algodon*, **101-2**, Buenos Aires, 1943, p. 483.) Owing to difficulties in the disposal of the low-grade portion of the Argentine cotton crop, it is suggested that the cotton be used to produce a fabric for making bags and sacks for flour, sugar, and other products, and thus obviate the necessity of importing jute burlap for the purpose. Progress in the establishment of a Government factory for the production of cotton bags is reported.

63. QUELQUES CONSIDÉRATIONS SUR L'ORIENTATION DE LA SÉLECTION COTONNIÈRE AU CONGO BELGE. By F. Jurion. (*Bull. Agr. Congo Belge*, **32,** 1941, p. 677. From *Pl. Bre. Abs.*, xvi., 1, 1946, p. 76.) A description is given of the improvement in yield, vegetative vigour, disease resistance, and quality obtained by mass and line selection of the variety Triumph Big Boll and other types. A brief account is also given of work on hybridization.

64. BRAZILIAN COTTON. (*Cotton*, M/c, 22/12/45.) The area planted to cotton in São Paulo for the 1945-46 season was about 60 per cent. less than that of the 1944-45 season. In a report to the Minister of Finance the local Cotton Planters' Association affirmed that, should there be no improvement during the remainder of the planting season, there would barely be enough cotton to meet the needs of the local textile industry, and there would also be a shortage of cottonseed oil and cake. The Association asserted that cotton-growing could continue only if a new official basis of financing were adopted.

65. PROGRESS REPORT OF THE COTTON DEPARTMENT OF THE NATIONAL AGRICULTURAL RESEARCH BUREAU IN CHINA FOR THE YEARS 1942 AND 1943 INCLUSIVE. By C. L. Hu. (*J. Amer. Soc. Agron.*, **37**, 1945, p. 610. From *Pl. Bre. Abs.*, xvi.,

1, 1946, p. 75.) The results for the years 1942 and 1943 of the work of the Cotton Department of the National Agricultural Research Bureau in the provinces of Shensi, Honan, Szechuan, Kweichow, and Yunnan are reviewed. The results are given of the tests of American cotton at five different locations in the western part of the Lung-Hai region, including portions of the Honan and Shensi provinces. The following varieties were tested: Stoneville 3 and 4, Delfos 531 and 719, and Lone Star. Selection has been carried out in Delfos 531, Stoneville, Coker 100-2, Chinese cotton, and hybrids between Chinese and Indian cottons, in various regions. A strain selected from a cross between Delfos 531 and okra-leaved American cotton, made several years ago, and named Chickenfoot Delfos, gave high yields in comparison with standard American cottons in the Shensi province; the strain has been renamed Central Bureau Chickenfoot Delfos and is to be increased. Varieties among the material brought for preservation to Free China at the outbreak of the Sino-Japanese war which deserve special mention are listed. A list is also given of selections showing particular promise which have recently been developed. The main results of the studies of the heredity of anthocyanin in Chinese cotton, carried on for several years, are summarized. Studies are in progress on the inheritance of the following characters in American cotton: light yellowish-green seedling, yellowish-green seedling, white apical bud, irregular leaf vein, and wave-like marginal leaf. The linkage relationships of these characters with various other characters are also under investigation. Linkage has been observed between the three characters, irregular leaf vein, green lint, and green seed. Since 1938, in the Yunnan province, research work has been conducted on tree cottons. Strains of the native free-seeded tree cotton are under test; several varieties collected in Yunnan are under observation. Studies have been made of the correlation of several characters. Leaf area appears to be correlated with the time of maturity and staple length; cotton with narrow leaf lobes matures earlier but has a shorter staple than broad-leaved cotton. The inheritance of certain leaf characters, such as okra leaf, yellowish-green seedling, and naked seed, were found to be determined by a single factor pair, respectively, and to show independent inheritance. The homogeneous purple leaf character appears to be correlated with low yield, the heterogeneous form with short staple length. Okra-leaf cotton usually shows a higher rate of boll shedding and a shorter fibre. In general, cotton developed from yellowish green seedlings has a shorter staple, higher lint percentage, and a smaller number of five-locked bolls. A detailed analysis of the factors determining yield has also been made—viz., boll number, lint percentage, percentage of rotten locks, and boll size. Growth studies of eight varieties of Chinese cotton and ten varieties of American are reported.

66. Ten Years' Results of Experiments and Extension Work with Delfos Cotton in China. By C. L. Hu. (*J. Amer. Soc. Agron.*, **37**, 1945, p. 616. From *Pl. Bre. Abs.*, xvi., 1, 1946, p. 76.) An account is given of trials with Delfos 531 and of the development of the cultivation of this variety in China during the last ten years.

67. Persian Cotton. (*Int. Text.*, **12**, 1945, p. 95.) Some 122,500 hectares were planted to cotton in Persia in the 1945-46 season, compared with 117,500 hectares planted during the previous season. The 1944-45 season produced between 14,000 and 15,000 metric tons of ginned cotton, which sufficed to supply domestic mills and left an estimated carry-over of between 5,000 and 7,000 tons. A recent decree of the Council of Ministers prohibits the importation of cotton during the current year; it is expected that the domestic crop, with the addition of the carry-over, will meet the needs of the mills of the country.

68. Peru. Cotton Crop, 1945. (*Cotton*, M/c., 15/12/45.) The 1945 cotton crop is estimated by the Cotton Chamber at 297,000 bales, compared with 310,000 bales in the previous year. Notwithstanding the Government's encouragement to reduce cultivation, the acreage planted to cotton was approximately the same as in 1944. Cotton held in Peruvian ports on July 19, 1945, totalled 370,000 bales, but most of it had been sold abroad. Exports in 1945 through August amounted to 125,000 bales, 78 per cent. more than the corresponding shipments last year. Con-

sumption by domestic factories continued at the annual rate of approximately 53,000 bales.

69. Tanguis Cotton: Selection Work in Peru. By A. Verdejo. (*Bol. Mens. Junta Nac. del Algodon,* **103-4,** Buenos Aires, 1943, p. 553. From *J. Text. Inst.*, xxxvi., **10,** 1945, A395.) The organization of La Molina Experiment Station, Peru, is briefly described, and an account is given of the work of the department of vegetable genetics on the improvement of Tanguis cotton by selection. Characteristics considered in the selection work, such as weight of seed cotton per plant, earliness, ginning out-turn, weight of 100 seeds, weight of seed cotton and fibre per boll, classification of fibre, resistance to wilt, etc., are discussed, and indications are given of progress being made. Charts for recording the results are shown.

70. Russia. Reconversion of Textile Industries. (*Int. Text.*, **12,** 1945, p. 94.) The Russian People's Commissar for the textile industry recently made a statement about reconversion plans for the industry; this will result in a sharp increase in production for civilian needs, with special attention to increasing the varieties and improving the finish of cloths. Large mills are reopening their art departments, and art councils are being set up in the trusts for the purpose of reporting on and approving the best designs. More than 100 plants which had been damaged during the war have been partially repaired and returned to production, and good progress is being made in restoring others. Among new textile enterprises established during the war are twenty in the Tatar Republic, Uzbekistan and Turkmenistan. Two new mills are expected to open soon in Novosibirsk and Kazakhstan.

71. New Varieties of Soviet Cotton. By V. Kosov. (*Cotton*, M/c, 23/6/45.) An article received by *Cotton* from the Press Service Department of the Soviet Embassy, London, contains an account of the work on cotton carried out at the research stations in the U.S.S.R. Varieties of cotton have been evolved which are early ripening, have good staple, and yield well, prominent among the strains being numbers 8517, 8196, C460, 35-1, 18819 and 246. New types have also been evolved with a coarse woolly fibre, and several that produce brown-coloured fibres. The research workers at the Turkmenian Experimental Station are engaged in developing coloured cottons of the following shades: light and dark blue, green, pink, and smoke colour.

72. Soviet Genetics and the "Autonomy of Science." By L. Kartman. See Abstr. 133.

73. Swedish Textile Research Institutes: Organization. By A. Engblom. (The *Svedberg* Commemoration Vol., 1944, p. 639. From *Summ. Curr. Lit.*, xxv., **20,** 1945, p. 474.) Recent advances in fundamental and directed textile research are summarized, and the present programme and organization of textile research in Sweden is reviewed, with illustrated descriptions of the Textile Research Institute of Chalmers University of Technology, Gothenburg, Lenning's Institute for Textile Technology, Norrköping, and the Textile Institute, Borås.

SOILS, SOIL EROSION, AND FERTILIZERS.

74. A Relative Study of Soil and Artificial Mulches in Conserving Soil Moisture. By D. Singh and S. D. Nijhawan. (*Ind. J. Agr. Sci.*, xiv., **5,** 1944, p. 364.) The results of pot and field experiments show that soil under artificial mulch can absorb more water than under soil mulch, as the water which passes through a layer of artificial mulch is protected from direct heat of the sun and the desiccating influence of the wind. Soil temperatures under artificial mulch are always lower than those under soil mulch or unstirred plots. Yields of cotton and barley from the artificial and soil mulch plots are given and the possibility of growing crops in the moisture conserved by artificial mulches is discussed.

75. Erosion in the Punjab, its Causes and Cure. A Survey of Soil Conservation. By Sir Harold Glover. See Abstr. 21.

76. The Kikuyu Lands: The Relationship of Populations to the Land in South Nyeri. Thoughts on the Foundations of Future Prosperity in the

KIKUYU LANDS. By N. Humphrey. MEMORANDUM ON POLICY IN REGARD TO LAND TENURE IN THE NATIVE LANDS. By H. E. Lambert and P. Wyn Harris. (Govt. Printer, Nairobi, Kenya Colony. 1945.) These three papers are concerned with the fundamental issue of land preservation, treated on the broadest basis as a social problem. Great stress is laid on the need to revivify indigenous tribal organizations as an agency in the regeneration of the land. A foreword gives instances of action in this direction by Government. The discussion has more than a local interest, as situations similar in general type exist in other places in East Africa where concentrations of population have upset traditional systems. Study of the population statistics of South Nyeri suggests a mean figure of 2 per cent. increase per annum. In 1944 the population per square mile was 542, allowing an average area per family of 6·71 acres. Making allowance for broken land the area available for crops was probably no more than 3·35 acres; in 1955 at the present rate of increase it would be reduced to 2·61. There are very considerable agricultural exports from the district, and the income from employment is large and is the chief factor in present prosperity. The view is held by all agricultural officers that the soil is steadily losing its fertility and its moisture-retaining capacity. Some large reduction in the pressure on the land is an essential preliminary to any plans for developing a sound farming system. An estimate of the land required per family for farming on a permanent system including cash crops is 12 acres, but it is emphasized that this should not take the form of a small-holding; some form of co-operative farming is considered essential. On this theoretical basis there is a present over-population of about 14,000 families. Without claiming any close degree of accuracy for the figures this conclusion indicates the dimensions of the problem.

The second paper is a sympathetic study of the customs and economy of the Kikuyu. In the improvement of the farming system shifting cultivation is accepted as the obvious starting point. This system, the value of keeping the soil under protective cover, and the disposal of crops so that each occupies its appropriate site, are all in line with native tradition. The present system of indiscriminate planting is far more alien than would be a more planned economy. There is a strong case for a water survey for the improvement of present supplies and the opening of new land. A bold plan of long range reafforestation would have advantages of the greatest importance.

The third paper is a consideration of the question recently enunciated by Lord Hailey's Committee on African Land Tenure—" how to ensure that the community retains the power to guard against the harmful consequences . . . of the growth of individual rights in land, while at the same time not impeding the developments of such rights, under proper control by the community, to the extent that they are an essential concomitant of economic or social progress." The authors' recommendations are summarized as follows: (*a*) that Government should accept as its immediate policy the principle of individual user with community control; (*b*) that in order to preserve the " traditional conception," community control, in its more immediate aspects, should mean the indigenous system of control. The indigenous quality of such immediate control should be preserved and there should be no attempt to formalize its institutions into imitations of European boards. The native principle of *ad hoc* constitution should be preserved. In other words, we recommend that nothing whatsoever should be done to the immediate indigenous controls except *to recognize and use them*; this, in most districts, represents a revolutionary change; (*c*) that the more remote controls should consist of boards constituted as far as possible as extensions of the indigenous system.

77. POPULATION PROBLEMS OF TANGANYIKA TERRITORY. By C. Gillman. (*E. Afr. Agric. Jour.*, xi., 2, 1945, p. 86.) Discusses the problems of the native population, its present distribution and its future better adjustment to the environment. Distribution is strikingly uneven. There are large and small clusters of great concentration here and there, attaining in some places densities between 780 and 1,230 to the square mile. These lie scattered through lands where the average density seldom surpasses 40, and there are large areas practically uninhabited. Of

the roughly five million inhabitants two-thirds live on one-tenth of the land, the remaining third occupies one-fifth, and nearly two-thirds of the Territory is uninhabited. This maldistribution, except in one specified area which can be otherwise explained, coincides with the distribution of permanent domestic water supplies. Rainfall in itself is not the determining factor; densely populated and uninhabited areas with similar rainfalls exist. The presence or absence of the tsetse fly affects the pastoral use of land, but a large part of the population of equatorial Africa, estimated at thirty to thirty-five millions, has adopted a type of land use without cattle from time immemorial. Neither do soils appear to have had any far-reaching influence apart from few and small local exceptions. As with rainfall, similar soils can be instanced carrying the opposite extremes of population, and the heaviest concentration of all lives on soils of very low natural fertility. The characteristic types of distribution are (1) the fly-free densely populated cultivation steppe of the plateaux, and the dense settlements on the isolated blocks of highlands, (2) the comparatively dense concentrations on the narrow strips along the few alluvial plains and at the foot of the scarps, (3) the large and widely scattered group of areas of medium and low density ranging across the upland savannas as well as the intervening lower regions and characterized throughout by the practice of bush fallowing, (4) the semi-arid areas, one-eighth of the Territory, occupied by the nomadic Masai and Tatoga. This arrangement is in the inverse order of stability. The areas in the first category are mostly overpopulated and their soils and water supplies are deteriorating. There is more stability in the second class, but their existence is progressively imperilled by the effects on their water supply of deterioration in the highlands. In the third class the practice of bush fallowing guarantees a higher degree of safety against land deterioration, and in the fourth class permanence is assured unless misguided efforts to induce nomads to become sedentary are successful.

To remedy this highly unsatisfactory state of affairs the goals to be aimed at in order of urgency are summed up as follows:

(1) Improve rural domestic water supplies in every conceivable manner and direction. (2) Concentrate on improving the diet, hygiene, and health of rural populations. (3) Stop the progressive deterioration of forests, soils, and water on the high blocks and cultivation steppes; and introduce without further procrastination, and promote energetically, long-range programmes for anti-soil erosion measures, better methods of husbandry, and reafforestation of the steeper mountain slopes, in order to rehabilitate as soon as possible these unstable regions of over-population. (4) Create land reserves, gradually expanding into the present "wastelands" from the margins of the more populous regions, where necessary with the help of anti-tsetse measures and concentrations. (5) Improve the as yet more stable scarp-foot lands by local irrigation and drainage schemes. (6) Give due consideration to the old Bantu culture of bush-fallowing by retaining its many good and useful practices with new modifications based on closer scientific control. (7) Draw the coastal strip and hinterland more closely into the Territory's agricultural structure. (8) Change emphasis gradually from native agricultural export to internal exchange. (9) Refrain from attempts to turn the small nomadic populations into sedentary peasants. (10) Beware of so-called panaceas, like "small peasant holdings" and others of the kind.

78. Cotton Plant: Growth and Nutrient Uptake: Influence of the Soil Colloids. By A. Mehlich and W. E. Colwell. (*Soil Sci. Soc. Amer. Proc.*, **8**, 1943, p. 179. From *Summ. Curr. Lit.*, xxv., **23-24**, 1945, p. 533.) Three mineral soils, different in their pH/base saturation relationships and widely different in their contents of kaolinitic and montmorillonitic material, were treated with lime to identical but increasing degrees of Ca saturation. This series was divided into two Mg levels, one constant and the other of increasing Mg content, to maintain a constant Ca: Mg ratio. Cotton was then grown on these soils. Yields from the montmorillonitic soils showed gradual and consistent increases from added Ca with a maximum at 80 per cent. In the kaolinitic and organic soils the increase from the first increment

of Ca was pronounced with no measurable effects above 40 per cent. Ca saturation. Calcium uptake from the kaolinitic soil was invariably higher than from the montmorillonitic soil. Total uptake of Ca and Mg, expressed as percentage of the original exchangeable cation present, showed that release of Ca is high in the kaolinitic and organic soils and decreases with increasing saturation. In the montmorillonitic soil the Ca release was low and little affected by the degree of saturation. Release of Mg from montmorillonitic soil was high, and low from the kaolinitic and organic soils. Results obtained from a soil consisting of a mixture showed that the montmorillonitic fraction exerted a predominant influence upon growth and mineral nutrient uptake. Equilibrium exchange of Ca and Mg by H-ions at symmetry concentration showed that the filtrate of the montmorillonitic soil became relatively richer in Mg and that of the kaolinitic soil relatively richer in Ca.

79. The Use of Commercial Fertilizers in Cotton Production. By J. J. Skinner. (*U.S. Dpt. Agr. Circ.* 726, 1945. From *Exp. Sta. Rec.*, **93**, 5, 1945, p. 571.) A practical discussion of the nutrient requirements of cotton, the form and function of fertilizer constituents including N, P, K, and secondary and minor plant nutrients, the efficient use of fertilizer, economy of higher analysis fertilizers, tonnage of fertilizers used on cotton, and recommendations to increase yields. Yields per acre largely determine the cost of production per pound and the profit in growing cotton, the principal cash crop of the South. In the south-eastern and south-central sections of the Cotton Belt the kinds and quantities of fertilizer influence yield and profit more than any other factor. Other cultural means of maintaining soil fertility and producing profitable yields are concerned with increasing acreages of legume cover crops, adopting proper rotations, and improving crop-management practices.

80. Responses of Cotton to Sulphur Fertilization. By H. C. Harris *et al.* (*J. Amer. Soc. Agron.*, **37**, 5, 1945, p. 323. From *Exp. Sta. Rec.*, **93**, 4, 1945, p. 428.) Results obtained with cotton in experiments on three soil types at Gainesville and Madison (locations about 100 miles apart) indicating S deficiency for the crop, suggested that there may be large areas in Florida where S is deficient.

81. Response to Residual Phosphorus of Cotton in Continuous Culture. By G. W. Volk. (*J. Amer. Soc. Agron.*, **37**, 5, 1945, p. 330. From *Exp. Sta. Rec.*, **93**, 4, 1945, p. 428.) Residual effects of P accumulated from fertilization (1930-43) on the yield of cotton grown on uneroded Hartsells very fine sandy loam were studied. Phosphate fertilization was discontinued, 1935-43, on certain plats. When P fertilization was discontinued after 30, 60, 90, and 120 lb. rates of P_2O_5 had been used annually, 1930-34, yields of cotton decreased decidedly. The residual effects on cotton that followed were obtained from the accumulated P, which was more or less in proportion to the amount added. Regardless of rate of P application, 1930-34, a crop of about 200 lb. of seed cotton occurred in the first or second year after fertilization stopped. Cotton yields where 30 lb. of P_2O_5 were applied in 1930-34 fell below the original yield of the check plats about three years after P fertilization was discontinued, whereas this point was reached in about seven years where 60 lb. P_2O_5 had been applied. The total amount of P unaccounted for by chemical analyses of soil and by crop removal in the surface 16 in. of soil approximated 25 per cent. of all added plus that in the original soil. This amount was about 2·5 times as much as was removed by cotton, 1930-43. P unaccounted for in the crop or in the 16 in. of soil is considered lost by erosion.

STATISTICAL TREATMENT, CULTIVATION, GINNING, USE OF SEED.

82. A New Method of Performing Field Trials. By B. G. Capo. (*J. Agr. Univ. Puerto Rico*, **28**, 1, 1944, p. 22. From *Exp. Sta. Rec.*, **93**, 5, 1945, p. 567.) The new method of performing field experiments with relatively small numbers of treatments is described, the requirement to be fulfilled by layouts of such field tests is specified, and examples of possible designs for a five-treatment experiment are

illustrated. The theory of the procedure of calculation is discussed, and a numerical example of calculations is given in connection with the interpretation of a fertilizer experiment with cotton.

83. A METHOD OF INTERPRETING THE RESULTS OF FIELD TRIALS. By B. G. Capo. (*J. Agr. Univ. Puerto Rico*, **28**, 1, 1944, p. 7. From *Exp. Sta. Rec.*, **93**, 5, 1945, p. 567.) The assumption of a different effect constant for every pair of adjacent plats of a randomized block field trial evidently led to greater precision in the reduction of corresponding data than assumption of a different effect constant for every different complete block of the experiment. A method usable in this connection to reduce calculational work to a minimum for interpretation of such experiments by use of the new assumption proposed is presented. Application of this method to results of randomized block experiments already performed requires more work than application of the usual methods of statistical analysis for which the experiments were designed, although justified by increase in precision. The number of operations required for the application of the method could be reduced by specially designing field trials.

84. THE PRECISION OF YIELD COMPARISONS FROM SMALL PLOT TRIALS IN SEA ISLAND COTTON BREEDING. By H. L. Manning. (State Coll. of Agr. and Eng., Univ. of North Carolina, 1945.) The following abstract is given of a thesis submitted to the Faculty of the State College of Agriculture and Engineering in partial fulfilment of the requirements for the degree of Master of Experimental Statistics.

Selection advance in Sea Island cotton breeding has been protracted owing to lack of precision in comparisons of the more important yield components. Previous replicated progeny row technique was successful only in demonstrating the major differences in these yield attributes. A Uniformity Trial was grown in St. Vincent, B.W.I. Various plot size combinations indicated that yield differences of 20 per cent., the proposed objective, were impractical with theoretical replication. It was shown, however, that satisfactorily small differences could be demonstrated using an 8-plant plot of 48 sq. ft. Blocks containing more than 5 but less than 10 plots, each of 8 plants, were found to be the most efficient. Incomplete block designs, suggested by studies of block size, were shown to be highly efficient for progeny row breeding. One of the more important objectives of the study was the practicability of examining large numbers of progenies. Using an 81-progeny lattice square design, yield differences of 20 per cent. were detected. In addition, adjusted data from the more variable yield components facilitated the construction of desirable yield analyses. Important varietal fertilizer interactions were shown to have a significant bearing on primary objectives of the breeding scheme.

85. FLAME CULTIVATION OF ROW CROPS. By P. W. Gull. (*Agr. Eng.*, **26**, 4, 1945. From *Exp. Sta. Rec.*, **93**, 6, 1945, p. 780.) A report on the development of the flame cultivating machine for the control of weeds and grass in cotton production, and a discussion of the experimental work and results obtained. Cotton to be flamed for weed control should be 8-10 in. tall and the stem at the ground level should be $\frac{3}{16}$ in. in diameter.

MACHINERY.

86. COTTON HARVESTING MACHINES: COSTS AND EFFECTS ON GRADE. By E. H. Helliwell. (*Text. World*, **95**, 7, 1945, p. 123. From *Summ. Curr. Lit.*, xxv., 21, 1945, p. 477.) A review of modern improvements in the harvesting of cotton by machinery. Hand-picking now costs about $40 per bale, but machine-picking only $5 or $6, inclusive of interest, labour, petrol, maintenance, and depreciation. One comparatively unskilled labourer can do the work of forty field workers. It is an advantage to cause the plants to shed their leaves before picking begins. This defoliation is effected by dusting the plants with a powder that kills the leaves in about six days; a tractor or aeroplane is used. Cotton machine-picked by modern methods is about 1½ grades lower in quality than hand-picked cotton, and it is characterized by a bluish-grey tint. This darkening of colour is ascribed to the fact that the cotton is left on the plants longer than usual, but the rapidity of machine-

picking restores the balance to some extent. A comparison of machine- and hand-picked cottons used in 20's–60's warp yarns is tabulated. Yarns from the machine-picked cotton were slightly poorer in appearance and about 0·7 per cent. weaker. Cleaning and drying at the gin would improve the grade. Of the saving to the grower about 3 to 5 cents per lb. may be expected to be passed on to the spinner in the S.L.M. and L.M. grades and more in the poorer grades.

87. COTTON CARDING ENGINE: SPEEDS: EFFECT ON PRODUCTION AND YARN QUALITY. By E. B. Grover and G. H. Dunlap. (*Text. Res. J.*, **15**, 1945, p. 97. From *J. Text. Inst.*, xxxvi., **10**, 1945, A402.) A detailed report is given of investigations of the effect of changes in speeds and settings of various working parts of cotton cards on card production, and the associated influence on yarn quality. Data are presented showing the effects of the changes on yarn strength, yarn appearance, waste, power consumption, neppiness, fibre strength, fibre length, relation of fibre strength to yarn strength, and sliver uniformity.

88. AN EASILY ASSEMBLED MACHINE FOR MAKING COTTON PLUGS FOR CULTURE TUBES. By O. K. Stark. (*Science*, **101**, 2629, 1945, p. 521. From *Exp. Sta. Rec.*, **93**, 5, 1945, p. 549.) The essential unit is a Waco Power Stirrer which has two shafts, one running at 300 and the other at 600 r.p.m. The only additional requirement is a foot-controlled rheostat for starting, stopping, and controlling the speed of the motor. With a little practice it is possible to make about 150 plugs per hour; they are of any desired size and can be used time after time.

PESTS, DISEASES, AND INJURIES, AND THEIR CONTROL.

89. WHEN TO BEGIN DUSTING FOR CONTROL OF COTTON INSECTS. By A. L. Hamner. (*Miss. Farm. Res.*, **8**, 5, 1945, p. 2. From *Exp. Sta. Rec.*, **93**, 4, 1945, p. 467.) A practical account.

90. AIR-SPRAYING FOR THE CONTROL OF COTTON PESTS. By S. Starostin. (In Russian. *Proc. Lenin. Acad. Agr. Sci. U.S.S.R.*, **9**, 5-6, p. 36. Moscow, 1944. From *Rev. App. Ent.*, xxxiii., Ser. A, **10**, 1945, p. 306.) An account of experiments in 1941 and 1942 to test the effectiveness of applying sprays from aircraft to cotton fields infested by the cotton noctuid (*Heliothis armigera*, Hb.) and the cotton aphid (*Aphis gossypii*, Glov.) in the region of Krasnodar, North Caucasia, and *Tetranychus telarius*, L., in Azerbaijan. In the case of *H. armigera* suspensions of calcium arsenate at rates of 2·7, 4·5, and 6·3 lb. in 5·4 gal. water per acre were compared with a dust of calcium arsenate at 9 lb. per acre, all applied from an aeroplane flying across the rows at times when there was a little dew and at a height of about 16 ft. The sprays were prepared on the day before they were used, and the spray tank was provided with a special agitator. Subsequent observations showed that the residues adhering to the leaves on the day of application and 5 days later were greater for all the sprays than for the dust on the upper part of the plants, and greater for all but the weakest spray on the lower part, and the percentages that adhered after 5 days were greater in every case for the sprays. Figures showing the results of the treatment on *H. armigera* are not given, but it is stated that the weakest spray was almost as effective as the dust and more economical. In similar tests against *A. gossypii* sprays of 2·5 or 1·25 per cent. anabasine-sulphate and 2·5 per cent. soap applied at about 9 gal. per acre were compared with a dust of anabasine-sulphate at about 31·5 lb. per acre. This dust was prepared by sprinkling 33 parts road dust with 2·5 parts 40 per cent. anabasine-sulphate as a 7·5 per cent. solution. The percentage mortalities of the aphid given by the three treatments after 48 hours were 100, 74·3 and 13 respectively. Thrips were also killed, but larvæ of *H. armigera* were not affected. Both sides of the leaves were wetted by the sprays, since the air currents produced by flying at such a low level apparently turned the leaves. The percentage mortalities in the controls were 9·7 in the case of the sprays and 3·1 in that of the dust. In the experiments against *T. telarius* a 10 per cent. suspension of sulphur containing 3 per cent. soap and a 4 per cent. solution of anhydrous-sodium carbonate (soda ash) and 4 per cent. soap, both at the rate of about 9 gal. per acre,

gave 77·2 and 68·7 per cent. mortality in six days, respectively, as compared with 62·9 per cent. given by a dust of sulphur alone at the rate of 27 lb. per acre. The tests were carried out late in the season, however, and the plants were only lightly infested, so that these results are not regarded as conclusive.

91. A NEW INSECTICIDE, DDT. By J. Harold Smith. (*Queensland Agr. J.*, **61,** 4, 1945, p. 216.) Deals briefly with the subject under the following headings: Field experimental work on DDT; Availability of the new insecticide; Preparation of DDT dusts and sprays; Pests against which DDT may be employed; Risk of plant injury; Residue problems.

92. DDT INSECTICIDE: DEVELOPMENT AND APPLICATIONS. By T. F. Webb and G. A. Campbell. (*Chem. and Indus.*, 1945, p. 156. From *J. Text. Inst.*, xxxvi., **9,** 1945, A387.) The work on insecticides that led to the development of DDT is reviewed, and tests of its action on various pests and applications to the control of flies and mosquitoes are briefly discussed.

93. DDT INSECTICIDE: APPLICATION AGAINST COTTON INSECTS. By U. C. Loftin. (*U.S. Dpt. Agr., Bur. Ent. Pl. Quar.*, E-657, 1945. From *Summ. Curr. Lit.*, xv., **19,** 1945, p. 423.) DDT was not so effective as Ca arsenate against the boll weevil. It was ineffective against the cotton leafworm and the cotton aphid. There were indications that red spiders were increased somewhat by DDT dusting. DDT was effective against plant bugs and stinkbugs, cotton flea hopper, cotton bollworm, and especially the pink bollworm. One application of 3 per cent. DDT dust gave a very good kill of a heavy infestation of *Thrips tabaci*, Lind., and *Frankliniella fusca*, Hinds, on cotton.

94. USE OF A DOUBLE-NOZZLED SPRAY APPARATUS FOR THE APPLICATION OF DDT OR OILS. By D. F. Starr. (*Science*, **102,** 2641, 1945, p. 156. From *Rev. App. Ent.*, xxxiii., Ser. A, **12,** 1945, p. 379.) Good deposits of DDT were obtained in laboratory experiments by using a spray apparatus having two nozzles converging at an angle of about 35°, one emitting water and the other an atomized DDT solution. The droplets mixed about 2-4 cm. from the nozzles. If the DDT solutions were prepared with water-miscible solvents, such as acetone or alcohol, the insecticide was precipitated when the organic solution mixed with the water and was deposited immediately on the sprayed surface as nascent precipitates, some liquid and some solid. Deposits on glass were well distributed, and the type of the particle depended on the concentration of DDT and the solvent used. Oranges and apples were successfully sprayed by this method. Solutions of DDT in solvents not miscible with water were also successfully dispersed in this apparatus. Liquids such as mineral oil were dispersed in the water phase much as in an emulsion, but the system was so unstable that the water drained off the sprayed surface, leaving almost all the oil. The deposits of DDT on glass were very resistant to water applied in drops similar to rainfall, and the deposit on apples appeared to be washed off no more rapidly.

95. REPORT OF THE CHIEF OF THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE, AGRICULTURAL RESEARCH ADMINISTRATION, 1942-43. By P. N. Annand. (U.S. Dpt. Agr., Washington, D.C. 1944. From *Rev. App. Ent.*, xxxiii., Ser. A, **8,** 1945, p. 258.) *Cotton Pests.*—In experiments against the boll weevil in Mississippi, dusting the plants from the ground or from aircraft with calcium cyanamide at the rate of 10-30 lb. per acre caused all the leaves and squares to be shed within 3-6 days. In addition to forcing the adults to enter hibernation in a starved condition, this operation also prevents staining of the lint by leafworms (*Alabama argillacea*) and aphids, improves the quality of the lint gathered by mechanical harvesters and facilitates hand-picking. *Aphis gossypii* was collected on 13 wild and cultivated plants during the winter and early spring in Louisiana; it was first observed on cotton on April 15, was accompanied by *A. medicaginis*, Koch., *Myzus persicae*, Sulz., and *Macrosiphum solanifolii*, Ashm., during May, and was the only aphid found on this crop after the middle of June. Pink bollworm (*Platyedra gossypiella*) was abundant on cotton in the lower Rio Grande Valley in 1942, owing to high overwintering populations and favourable conditions, and extended its range, mostly by migration

from early to later crops; the desirability of adopting uniform planting dates over a given area is emphasized. . . . The percentage survival of overwintering larvæ of the bollworm, *Heliothis armigera*, in cages in Texas was only 0·4 as compared with 23 in the previous year. *Alabama argillacea* was first observed near Brownsville, Texas, on April 13 in 1942, the earliest date on which it has been recorded. Most damage was caused in the western and northern cotton-growing areas. . . . In experiments on the control of the cotton fleahopper (*Psallus seriatus*, Reut.) in Texas, dust mixtures of basic copper arsenate and sulphur applied to dry plants at midday were as effective as the standard dust of calcium arsenate and sulphur applied early in the morning, and more effective than standard or micronized sulphur applied alone or with calcium arsenate at midday. In the absence of arsenicals, sulphur can be satisfactorily used alone against this capsid.

96. Curculionideos do Algodoeiro. By O. Monte. (*Biologico*, **10**, 9, São Paulo, 1944, p. 278. From *Rev. App. Ent.*, xxxiii., Ser. A, **10**, 1945, p. 311.) Cotton is attacked in Brazil by the weevils *Eutinobothrus* (*Gasterocercodes*) *brasiliensis*, Hambl., *Chalcodermus bondari*, Mshl., and *C. marshalli*, Bondar. *E. brasiliensis*, of which all stages are described, is the most important of the three, and is represented in part of its range (Pernambuco) by an unnamed variety. A detailed account is given, largely from the literature, of its bionomics and control. In the author's observations in Minas Geraes, in a locality where the temperature averaged 26°C. (78·8°F.), the egg, larval, and pupal stages lasted 5-6, 30-45, and 5-15 days respectively. There may be two generations a year. The parasites that have been recorded from this weevil are shown in a list; none affords effective control. *C. bondari*, the bionomics and control of which are also reviewed from the literature, may be a synonym of *C. niger*, Hust., which was described from Bolivia, but the name is retained provisionally for the species that infests cotton in Brazil. *C. marshalli* was recorded from cotton for the first time in 1941, when it was observed attacking plants in an experimental field at Torres do Tibagi. In breeding experiments the egg, larval, and pupal stages averaged 4, 23, and 8·5 days respectively. The measures of control recommended are the same as for *C. bondari*.

97. Notes on *Helopeltis sanguineus*, Popp., on Cotton in Nigeria. By F. D. Golding. (*Bull. Ent. Res.*, **36**, 1, 1945, p. 75. From *Rev. App. Ent.*, xxxiii., Ser. A, **12**, 1945, p. 383.) The author refers to taxonomic difficulties with regard to species of *Helopeltis* on cotton in Nigeria and cacao in the Gold Coast; red and yellow individuals attacking cotton in Nigeria have both recently been identified as *H. sanguineus*, Popp., and were shown by breeding experiments in 1942 to belong to the same species. Lists are given of twelve plants on which this species was observed to breed and five on which adults were seen feeding. It appears to be extremely rare during May and June, but adults become more numerous in July on *Spondias mombin*, and the first migrants appear on cotton in the first week of August, probably mainly from that plant. Some of the female migrants are gravid, the first nymphs appear on the cotton about a fortnight later, and adults and nymphs are abundant from mid-September until mid-December. After this, conditions are normally unfavourable, as the cotton plants are producing few new shoots and a dry wind is blowing, and nymphs are rare and adults rapidly decline in numbers. There appear to be three generations between early August and the middle of December. In February, 1939, adults and one small nymph were found on a species of *Jussieua* (*Jussiaea*) growing on the bank of a river when nearly all the *Helopeltis* population had left a cotton field 400 yards away; it was found that evaporation was 40 per cent. less near the river. In 1943, breeding on cotton ceased in early January and no nymphs were found during February and March, but adults were fairly numerous on young plants of *S. mombin* and *Paullinia pinnata* until early May, and a few nymphs were present during April. Almost all the breeding and feeding records for other plants were made during the cotton season, between late September and the middle of February. There are considerable variations from season to season in the abundance of *Helopeltis* on cotton at Ibadan, but no correlation could be found between these variations and climatic conditions. Analysis of soil samples taken

on each side of a number of cotton plants, some of which were severely and others lightly attacked, did not reveal any significant differences between the two groups. It was noticed that attack was particularly severe in a water-logged area and less severe on cotton following *Stizolobium (Mucuna) aterrimum* than on that following either maize or yams, both of which retard the growth of the cotton plants during the early part of the season.

98. Cotton Jassid (*Empoasca devastans*, Dist.) in the Punjab. V. A Note on the Characters of the Plant Associated with Jassid Resistance. By M. Afzal and M. Abbas. (*Ind. J. Ent.*, **5**, 1-2, 1944, p. 41. From *Rev. App. Ent.*, xxxiii., Ser. A, **12**, 1945, p. 386.) American varieties of cotton introduced into India are highly susceptible to attack by *Empoasca devastans*, Dist., and in view of the unsatisfactory control of this jassid given by insecticides and the absence of effective natural enemies the development of resistant varieties of cotton appears to be the only method available to reduce loss. Hairiness of the leaves has been regarded as an indication of resistance, but recent work has cast some doubt on its reliability as a criterion, and evidence is accumulating that hairiness is not itself the resistant factor. It was concluded from previous investigations that the toughness of the cuticle of the leaf veins, which prevented the entry of the ovipositor, was the primary character rendering plants resistant, since once the eggs were laid in the leaf veins of even such immune varieties as *desi* cotton (*Gossypium arboreum*) they hatched and the nymphs developed normally. Measurement of toughness proved difficult, however, and experiments, which are described, were therefore carried out on the value of other characters, such as the moisture content of the leaf veins, which varied with rainfall or irrigation, the *p*H value of the cell sap, which was not associated with resistance, the thickness of the cuticle of the leaf veins, which did not differ in susceptible and resistant varieties, and the hairiness of the leaf veins. This last character showed a close correlation with resistance, and it was also found that the density of the hairs was highly correlated with their length. In the experiments with hybrids, the density of the hairs on resistant plants varied over a very narrow range about a mean of 127·5 per cm., and tended to lie towards the upper limit. The mean number of hairs per cm. on susceptible plants was 34·31, but the density varied over a considerable range, and it is therefore desirable in breeding for resistance to select only the very hairiest plants.

99. Hairiness of Cotton Leaves and Anti-Jassid Resistance. By K. B. Lal and M. Afzal Husain. (*Curr. Sci.*, **14**, 1945, p. 153. From *Pl. Bre. Abs.*, xv., **4**, 1945, p. 311.) The resistance of hairy-leaved varieties to jassid attack is said to be due not to the inability of the insect to feed on hairy leaves but to its inability to oviposit. The character of jassid resistance should therefore be sought in the leaf veins, the site of oviposition. A more critical approach to the use of hairiness as an indicator of jassid resistance is advocated.

100. Summary Report on the Work of the Third Egyptian Anti-Locust Unit to Arabia. By M. Hussein. (*Bull. Soc. Fouad Ier Ent.*, **28**, Cairo, 1944, p. 4. From *Rev. App. Ent.*, xxxiv., Ser. A, **1**, 1946, p. 15.) An account of a campaign against *Schistocerca gregaria*, Forsk., in Hejaz, Asir, and Yemen in January-June, 1944, together with topographical and meteorological data, observations on the movements of the swarms and on breeding areas, both of which are shown on maps, and details of the technique adopted for the application of poison bait. . . . Of the measures employed when poison bait was not available, spraying with solar oil was effective. In late May, swarms of immature adults entering Hejaz from the east showed a high degree of parasitism by dipterous larvæ.

101. La Problème du Criquet Pèlerin (*Schistocerca gregaria*, Forsk.) au Congo Belge. By H. G. Bredo. (*Bull. Agr. du Congo Belge*, xxxv., No. 1-4, 1944, p. 174.) An account of the invasion of the Belgian Congo by the *criquet pèlerin* or desert locust, which first appeared in 1930. Lists are given of important plants in the Belgian Congo that are severely or occasionally attacked, and the control measures recommended against hoppers and swarms are summarized.

102. Une Nouvelle Méthode d'Appréciation de l'Effet de Groupe chez les

ACRIDIENS MIGRATEURS. By R. Chauvin. (*Ann. Sci. Nat.*, 5, Paris, 1944, p. 79. From *Rev. App. Ent.*, xxxiii., Ser. A, **7**, 1945, p. 201.) Adults of *Schistocerca gregaria*, Forsk., have a lower content of acridioxanthine in the solitary phase than in the gregarious phase, but since no method is available for isolating this pigment, direct quantitative estimation to differentiate the phases biochemically is impossible. The author describes a colorimetric method that makes it possible to arrive at an approximate index of the degree of transformation from one phase to another.

103. STUDIES IN *Schistocerca gregaria*, FORSK. XI. THE INFLUENCE OF TEMPERATURE ON THE GROWTH IN WEIGHT AND SIZE OF THE HOPPERS. By M. A. Husain and C. B. Mathur. (*Ind. J. Ent.*, **5**, 1-2, 1944, p. 107. From *Rev. App. Ent.*, xxxiii., Ser. A, **12**, 1945, p. 388.) Comparative studies in India on hoppers of *Schistocerca gregaria*, Forsk., reared at constant temperatures of 27, 32, 37, and 40°C. (80·6, 89·6, 98·6, and 104°F.) showed that the increase in their weight during each instar and during total development varied immensely with the temperature of both sexes. The influence of temperature on size was studied with hoppers reared at 40 and 27°C. Those reared at 27°C. were the larger, and there was a progressive increase in the difference in the size of various parts of the body in each instar. Four biometrical ratios calculated for the adults were found to differ at the two temperatures. The E/F ratios of those reared at 27 and 40°C. conformed, respectively, with those stated by Ramchandra Rao in 1942 to be characteristic of phases *solitaria* and *transiens*. All the newly hatched hoppers showed coloration typical of phase *transiens*, they were isolated throughout their development, and the resulting adults all had coloration typical of phase *solitaria*. The observed differences in the biometrical ratios were therefore not due to phase transformation, but were related to differences in the size due solely to temperature, and it is suggested that the difference in biometrical ratios between the phases merely reflects the difference in size of the locusts belonging to them.

104. THE SITE OF THE ABSORPTION OF WATER BY THE EGG OF THE DESERT LOCUST (*Schistocerca gregaria*, FORSK.). By C. B. Mathur. (*Ind. J. Ent.*, **5**, 1-2, 1944, p. 35. From *Rev. App. Ent.*, xxxiii., Ser. A, **12**, 1945, p. 386.) Since the development of the eggs of *Schistocerca gregaria*, Forsk., is retarded or suspended in soil of low moisture content, indicating that the absorption of water is essential for its continuance, laboratory experiments, which are described, were carried out in Baluchistan to determine the site of absorption in the egg. It was found that water enters only through a specialized region situated at the extreme posterior end. This region is functional almost from the time of deposition, but probably exists then only as a permeable membrane, later becoming more elaborate in structure. It corresponds in position with the specialized region (hydropyle) described by E. H. Slifer for the egg of *Melanoplus differentialis*, Thos., which, however, in experiments at 25°C. (77°F.), did not become functional until development had proceeded for six days.

105. THE BIONOMICS OF *Schistocerca obscura*, FABR. By L. G. Duck. (*J. Kans. Ent. Soc.*, **17**, 3, Manhattan, Kan., 1944. From *Rev. App. Ent.*, xxxiii., Ser. A, **8**, 1945, p. 237.) During a recent outbreak of grasshoppers in Oklahoma *Schistocerca obscura*, F., became unusually abundant and caused some damage of minor economic importance. All stages of this acridid are described, its distribution is reviewed, and the results are given of investigations on its bionomics, carried out from June 1938 to July 1939. In the field, the nymphs fed on low, scrubby elm growth from the time they hatched in the spring until they became adult, and the adults fed chiefly on elm and on maize and cotton in neighbouring fields. They were constantly moving between the crops and the elm, but did not attack the maize until it was 5 ft. high, and migrated to the cotton when the maize became dry. In late autumn they attacked young wheat if it was near sites suitable for oviposition. Food preferences were similar under cage conditions; the adults preferred elm and cotton, and fed on green, mature maize, persimmon, and wheat more readily than on many other plants offered to them; they did not feed at all on young maize or grasses of various genera. In greenhouse experiments, in which elm was the principal food,

pairing and oviposition occurred on an average 18 and 44·1 days respectively, after the females became adult. The intervals between the deposition of the first and second and the second and third egg-pods were 5-11 and 9-21 days respectively, and the number of eggs per pod in first, second, and third pods averaged 75·4, 42, and 31. The duration of the egg stage in days and (in brackets) the percentage of eggs that hatched averaged 261·3 (50·3) at outside temperatures and 83·1 (10·87) at about 68°F. The duration of the nymphal stage averaged 46·1 days at 89·9°F., 51·2 days at 85°F., and 51·5 days out of doors; nymphs reared at 70°F. were in the fifth instar at the end of the investigation, and the rate at which they developed indicated that much more time would be required at this temperature. Nymphs reared at low temperatures and under crowded conditions were considerably darker in colour than isolated individuals reared at higher temperatures; population density appeared to exert a greater influence than temperature on coloration. This change is believed to show a tendency for the species to assume a partial migratory phase.

106. STUDIES ON THE ECOLOGY AND CONTROL OF THE MOROCCAN LOCUST (*Dociostaurus maroccanus*) IN IRAQ. I. RESULTS OF A MISSION OF THE IRAQ DEPARTMENT OF AGRICULTURE TO NORTH IRAQ IN THE SPRING OF 1943. By F. S. Bodenheimer. (*Bull. Iraq. Dir.-Gen. Agr., No.* 29, Baghdad, 1944. From *Rev. App. Ent.*, xxxiii., Ser. A, **7**, 1945, p. 199.) This is a report on the results of field observations on *Dociostaurus maroccanus*, Thnb., carried out in April-June 1943 in an area about 29 miles west of Mosul, northern Iraq. A short account is also given of the evidence, found in Assyrian texts and figures, of the importance of locusts in Iraq in the earliest historical times.

The hatching of the eggs was delayed in 1943, and was attributed to the high rainfall in March. Hatching in the field continued from about April 3 to April 28, but the hoppers that hatched late apparently developed more quickly than the others, since practically all reached the fifth stage at about the same time. . . . Local movements of hopper bands and adult swarms within the area under observation are described, and some examples of full-day observations on their behaviour are given. . . . Estimates of the population density, made by counting the hoppers and adults attracted to bait pans from representative small areas, though unsatisfactory for the later hopper stages, showed that density increased up to the third and fourth stages, after which there were sharp decreases for the fifth and adult stages. . . . Field experiments on control showed that bran moistened with water was a more attractive bait than bran moistened with crude oil, and that the addition of date molasses to the moist bran did not increase its attractiveness. Up to 85 per cent. mortality was obtained with a bait of bran moistened with water and containing 2 per cent. sodium arsenite applied at the rate of 16 lb. per acre. The optimum time for spreading the bait was before 8 in the morning.

107. CONTROL OF SPOTTED BOLLWORM OF COTTON IN SIND. By G. R. Sharma and L. R. Mahindra. (*Ind. Frmg.*, vi., **10**, 1945, p. 465.) A brief account of the "clean-up" campaign organized in Sind during the 1941-42 to 1943-44 seasons to control the spotted bollworm which has caused considerable damage to cotton in the Province. To ensure success for the campaign extensive propaganda was conducted by means of leaflets, handbills, and posters, and by cinema shows illustrating the injury to cotton caused by the pest. Legislation was suggested to ensure the measures recommended for control being carried out, and a scheme was submitted to Government for consideration.

108. FURTHER NOTES ON THE BIONOMICS OF *Bemisia gossypiperda*, M. AND L., THE WHITE FLY OF COTTON IN THE PUNJAB. By K. N. Trehan. (*Ind. J. Agr. Sci.*, **14**, 1, 1944, p. 53. From *Rev. App. Ent.*, xxxiii., Ser. A, **12**, 1945, p. 391.) The author gives additional information on the bionomics of *Bemisia tabaci*, Gennadius (*gossypiperda*, Misra and Lamba), on cotton in the Punjab, obtained in the course of investigations carried out at Lyallpur in 1931-36. Of about 8,000 adults collected in March-May, only 22 per cent. were males, indicating that excessive parthenogenesis during that period may be due to the excess of females. As the use of coloured traps for Aleurodids has been suggested, the attractiveness of various colours for

the adults was tested by counting the numbers caught in cages on glass tubes filled with coloured liquid and coated with a transparent adhesive. Yellow and yellow-green were equally attractive and much more so than other colours, while orange, blood red and blue were more attractive than no colour (water), bright red, orange-red, or purple. The adults are probably carried long distances by wind; uninfested seedlings, planted on roofs 40 ft. high and 150 yards from the nearest cotton field, became infested in a few days. On plants caged with newly emerged adults, 51·5 per cent. of the total eggs were laid on the top leaves, 46·7 per cent. on the middle ones, and only 1·8 per cent. on the bottom ones, and the preference for the top of the plant was confirmed by field observations. In nature, the eggs are deposited on the lower surface of the leaves, and in cages about 80 per cent. were laid on the natural lower surface even if it was turned upwards. When batches of females were kept at different temperatures no eggs were laid at 19°C. (66·2°F.), and of the total number 0·2, 3·8, 9·6, and 14·3 per cent. were laid at 21, 24, 27, and 30°C. (69·8, 75·2, 80·6, and 86°F.), and 24·3, 24·1, and 23·6 per cent. at 33, 35, and 37°C. (91·4, 95, and 98·6°F.). This preference for the temperatures above 33°C. explains the active multiplication during May-September, when the average maximum temperature ranges from 33 to 41°C. (105·8°F.). Observations on varietal susceptibility of cotton to infestation by *Bemisia* included investigations of the *p*H value and the moisture content of the leaves. There was no strict relationship between the percentage of moisture in the leaves and attack, but the variety with the lowest percentage of moisture was heavily infested. Tests to determine the relation between the amount of water applied to the crop and incidence of attack, in which plots received 3-10 irrigations, showed that those that received the largest number had the lowest average infestation, whereas plots that received restricted irrigation were comparatively severely infested; it is concluded that 6-7 irrigations are needed to affect infestation significantly. In a test made in 1934, cotton in alternate plots was sown in lines or in pits 5 ft. apart, filled with farmyard manure. The plants grown in the pits, each of which had only one, were very bushy and were less infested than the others.

109. *Marasmius* Sp., Nouveau Parasite du Cotonnier dans le District du Congo-Ubangi. By C. Leontovitch and H. De Saeger. (*Bull. Agr. Congo Belge*, xxxi., 1-4, 1940. From *Rev. App. Mycol.*, xxiv., **10,** 1945, p. 413.) Cotton in the native plantations of the Congo-Ubangi was observed to be affected by sporadic outbreaks of an apparently new disease which caused sudden death of the affected plants. In 1937-38 the affected area included the territories of Bumha, Lisala, and Budjala—*i.e.*, the greater part of the forest area in the cotton-growing zone—and it is more than probable that the disease is present elsewhere also. The first symptom is loss of turgescence in certain leaves—which are in many cases reddish-yellow—in October, when the plants are actively growing and the bolls have almost reached their maximum size. Later on, the leaves fall, leaving only the bolls, which mummify on the dead plants or themselves drop. If the diseased plants are removed, remains of another plant, generally *Aframomum* sp., are usually found adhering to the collar, which is sometimes swollen and covered with a white to brownish-yellow mycelium. The woody vessels in the cotton stem are the colour of wine lees. The presence of the *Aframomum* fragments appeared to be the result of clearing the ground seven or eight months previously, and fructifications of the fungus were found on pieces of the rhizomes of this host lying on the ground. The fungus was identified as a species of *Marasmius*. Before the disease can spread to cotton the stem tissues must have become lignified; young cotton is not attacked. The mycelium develops on the cotton stems immediately after contact has been made with the *Aframomum* debris, penetration taking place within ten days. Death of the cotton plant ensues most rapidly when the *Aframomum* is in contact with the roots. While isolated cotton plants are most commonly affected, several plants may be attacked together. The fungus was also found on cut-down banana plants, and in one case had passed therefrom to cotton. It is always transmitted through contact with plant debris, on which it exists saprophytically. The sporophores develop only in the saprophytic phase or after the death of the parasitized host and under conditions of particular

humidity; they rapidly dry up. In general, losses due to the disease are under 1 per cent. but are most severe in land poorly cultivated by natives on badly selected sites naturally fallowed for two to four instead of ten to twelve years. The removal and destruction of the affected cotton are recommended. *Aframomum* debris should be collected and burnt before earthing-up the cotton.

110. Note au Sujet de la Région Cotonnière de Mahagi et Essai d'Introduction dans l'Uélé du Parasite du Ver Rose de la Capsule, le *Microbracon kirkpatricki*, Wilk. By J. M. Vrydagh. (*Bull. Agr. Congo Belge*, xxxv., No. 1-4, 1944, p. 181.) Part I contains a short account of the topography, vegetation, climate and soil of the cotton-growing area of Mahagi, near Lake Albert, in the Belgian Congo. An annotated list is given of the insects attacking cotton, which include three species of *Dysdercus* (stainers), *Platyedra gossypiella* (pink bollworm), *Zonocerus variegatus*, L., *Calidea dregii*, Germ., *Helopeltis* sp., *Earias* sp., *Sylepta derogata*, F., and jassids. The second part of the paper discusses an attempt to introduce into Uélé the parasite *Microbracon kirkpatricki*, Wilk., which was first found on pink bollworm in Mahagi in February 1942, but little success was achieved. It is considered, however, that if *Microbracon kirkpatricki* can be successfully introduced it will certainly diminish the menace from pink bollworm.

111. Causes of Poor Effectiveness of *Trichogramma* in the Experimental Control of Pests. By V. Stark. (In Russian. *Proc. Lenin. Acad. Agr. Sci. U.S.S.R.*, **9**, Moscow, 1944, No. 5-6, p. 26. From *Rev. App. Ent.*, xxxiii., Ser. A, **10**, 1945, p. 306.) The author considers that the disappointing results that have in some cases followed the liberation of predators and parasites of insect pests in the Russian Union, especially that of *Trichogramma* spp., may be due largely to the adoption of breeding methods involving constant conditions of temperature and humidity. This leads, in the case of *Trichogramma*, to the production of populations with reduced ecological adaptability, and it has been observed that the bulk of the parasites produced in this way congregate after release in parts of the infested area in which conditions resemble those under which breeding takes place. Their ecological adaptability is invariably less than that of the host, and their effectiveness is reduced in proportion. In experiments in 1938-40, populations of *Trichogramma* bred at constant temperatures and humidities and liberated did not penetrate into parts of the experimental plots in which the relative humidity was below 65 per cent., and did not attack eggs in exposed situations, whereas individuals from stocks reared for generations under changing conditions dispersed over a larger area and behaved as did those taken in the field and released. In experiments in the region of Voronezh, *Trichogramma* was released at the rate of 40,000 per acre against *Agrotis* (*Euxon*) *segetum*, Schiff., in two fallow fields in which 17 and 29 per cent. of the soil surface was covered with vegetation. The resulting percentages of parasitism of the eggs averaged 46·9 and 62·6 respectively, for parasites bred under constant conditions, 77·2 and 86·8 for those bred under varying conditions and 84·4 and 89·6 for those taken in nature and liberated. On the basis of these observations, the author considers that by rearing parasites or predators at changing temperatures, humidities and light intensity, with fluctuations greater than in nature, it might be possible to obtain populations adapted to an even greater range of conditions than the hosts against which they are to be liberated.

112. An Introduction to the Taxonomy and Nomenclature of Fungi. By G. R. Bisby. (Imp. Mycological Inst., Kew, Surrey, 1945. Price: 5s. or U.S. $1.25.) Suggestions are given to students on collecting, examining, culturing, describing, and preserving fungi. The section on nomenclature includes notes on categories of fungi, synonymy, types, and diagnoses, followed by the International Rules of Botanical Nomenclature, annotated for mycologists.

[*Cf.* Abstr. 172, Vol. XXII. of this Review.]

113. What are the Mycologists doing about Nomenclature? By G. R. Bisby. (*Ann. App. Biol.*, xxxii., **2**, 1945, p. 183. From *Rev. App. Mycol.*, xxiv., **12**, 1945, p. 473.) After commenting on the undue length of the International Rules of Botanical Nomenclature, the author suggests that they could be somewhat

simplified, and that it might be useful to have a shorter, supplementary code for fungi. The views of plant pathologists, industrial mycologists, and others should be obtained regarding the capitalization of epithets and the possible conservation of important ones. The conservation of generic names should receive further consideration, and preparation begun for the proposal of important genera for conservation at the next Botanical Congress. Finally, the author recommends the reconstruction of the Special Committees appointed by Congresses, in order to secure more effective action.

114. A Dictionary of the Fungi. By G. C. Ainsworth and G. R. Bisby. (Imp. Mycological Inst., Kew, Surrey. 2nd Edit., 1945. Price: 20s. or U.S. $4.60.) In this work an attempt has been made to give a list of all the generic names of Fungi (Eumycetes and Myxothallophytes, but not the Bacteria and Lichens) that have been in use up to 1944. About half of the 7,000 generic names are listed as synonyms. For every genus accepted a systematic position is given together with the distribution and number of its species. There are, in addition, short accounts of the chief Families, Orders, and Classes of Fungi and of the Bacteria and Lichens; explanations of about 2,000 mycological terms; the common and scientific names of important fungi; and other details of interest to systematic and applied mycologists and to plant pathologists. There are 10 plates giving 138 figures chosen to illustrate different groups of fungi and mycological terms. The writing has been done in Basic English.

[*Cf.* Abstr. 185, Vol. XXI. of this Review.]

115. Microbial Antagonisms and Antibiotic Substances. By S. A. Waksman. (The Commonwealth Fund, New York. $3.75. Oxford Univ. Press, London. £1 2s. 0d. 1945. From *Rev. App. Mycol.*, xxiv., **10**, 1945, p. 426.) The author describes this treatise as an attempt "to present the broad interrelationships among micro-organisms living in association, either in simple mixed cultures or in complex natural populations, with special attention to the antagonistic effects." Among the aspects of mycological or phytopathological interest referred to may be mentioned *Actinomycetes* and fungi as antagonists, the chemical nature of antibiotic substances, and the microbiological control of soil-borne diseases. A bibliography of 1,016 titles is appended.

116. The Mechanism of Radiation Effects and the use of Radiation for the Production of Mutations with Improved Fermentation. By A. Hollaender. (*Ann. Mo. Bot. Gdn.*, **32**, 1945, p. 165. From *Pl. Bre. Abs.*, xv., **4**, 1945, p. 328.) A survey is given of papers dealing with the response of viruses, bacteria, and other organisms to ultra-violet light and X-irradiation, and the problems of inducing economically valuable mutations in *Aspergillus* and *Penicillium*.

117. Culture Types and Pathogenicity of Isolates of *Corticium solani*. By B. R. Houston. (*Phytopathology*, xxxv., **6**, 1945, p. 371. From *Rev. App. Mycol.*, xxiv., **12**, 1945, p. 469.) On the basis of cultural characters and observed pathogenicity, 52 isolates of *Corticium solani* were selected for study from 260 collections on 15 Californian crop plants. They were divided into three culture types, of which (A) was characterized by a heavy, stroma-like layer on the surface of the medium, nearly white at first, turning pale drab-grey to light drab, often convoluted; natal-brown sclerotia, frequently radiating out from the point of inoculation; a sparse, white to cinnamon aerial mycelium; a rapid growth rate (1 to 1·8 mm. per hour); and commonly a distinct darkening of the medium; (B) by no well-defined, superficial stromatic layer; few, natal-brown, globular sclerotia, 1 to 4 mm. in diameter; very profuse, pale olive to sayal-brown mycelium; a moderate growth rate (0·6 to 0·8 mm. per hour); and no darkening of the substratum; (C) by a slight, vinaceous-buff, later wood-brown, superficial stromatic layer; natal-brown, globular sclerotia with a very irregular surface, often united into groups up to 15 mm. in diameter, while the scattered individuals measured 1 to 5 mm.; little or no aerial mycelium; a moderate to slow growth rate (0·5 to 0·7 mm. per hour); and moderate or no darkening of the medium. The hosts of type (A) included beans, cotton, cow-peas, potato, rhubarb, spinach, vegetable marrow, sugar beet, and tomato; (B) was isolated exclusively

from dry-rot cankers on sugar beet; and (C) was collected on lucerne, asparagus, pink beans, celery, potato, strawberry, and tomato. The pathogenicity of 26 isolates of type (A), 9 of (B) and 13 of (C) was tested on lucerne, cotton, spinach, sugar beet, and tomato, and the following average percentages of infection were secured: (A) 82, 79, 64, 73, and 53 respectively; (B) 10, 4, 1, 7, and 3; (C) 7, 5, 5, 7, and 2.

118. MILDEW AND ROT-RESISTANCE TESTS. See Abstrs. 160-168.

119. RED LEAF IN AMERICAN COTTON (*Gossypium hirsutum*). (*Ind. Frmg.*, vi., 1945, p. 469.) Three types of red leaf occur in *hirsutum* cotton. The first is due to nitrogen deficiency in the soil, and this reddening of the leaf is preceded by yellowing. The remedy against this is the application of sulphate of ammonia. The second type of red leaf is usually patchy in appearance, and is associated with crumpling of the leaf, a direct result of jassid attack. The remedy against this trouble is the breeding of varieties of cotton resistant to jassid. The third type of red leaf is a genetic character, often subject to environmental conditions for its proper expression, and in the absence of the first two kinds does no harm to the plant, and may even be a desirable character as it hastens maturity.

120. EFFECT OF LOW TEMPERATURES ON SURVIVAL OF *Phymatotrichum omnivorum*. By W. N. Ezekiel. (*Phytopathology*, xxxv., **5**, 1945, p. 296. From *Rev. App. Mycol.*, xxiv., **10**, 1945, p. 414.) Tests were carried out at the Texas Agricultural Experiment Station to determine the reaction of the cotton root-rot fungus, *Phymatotrichum omnivorum*, to low temperatures, a matter of practical importance in relation to the possibility of its survival if introduced into areas north of its present range. The pathogen did not withstand more than 24 hours' exposure in the laboratory to a temperature of – 13°C. either in the form of vegetative growth on potato dextrose agar slants, in large sclerotial masses high on the walls of flask cultures, or as portions of sclerotial masses on agar slants or buried in moist soil. Growth was inhibited at 5°C. but even after 50 days there was no reduction of viability. The northern limit to the natural occurrence of root-rot is in general agreement with several summaries of recorded temperatures, notably in respect of the line at which the minimum observed air temperatures reached 23°C. In conjunction with the susceptibility to cold shown by *P. omnivorum* in laboratory trials, this relationship suggests that the northward spread of the disease has been limited by the prevailing temperatures, and that the organism is unlikely to establish itself north of its present range.

121. STUDIES ON THE ROOT-ROT DISEASE OF COTTON IN THE PUNJAB. XIV. EFFECT OF SOIL TREATMENT ON DISEASE INCIDENCE. By R. S. Vasudeva. (*Ind. J. Agr. Sci.*, xv., **1**, 1945, p. 36.) The results of experiments on soil fumigation; various cultural treatments described, such as removal of diseased debris, flooding, trenching, and tillage; and the application of fertilizers to the soil, have given no indication of the possibility of evolving a practical method of control of root-rot disease of cotton in the Punjab.

[*Cf.* Abstr. 467, Vol. XXII. of this Review.]

122. THE THEORETICAL BASIS OF VIRUS DISEASES OF PLANTS. GENERAL THEORY OF VIRUSES. By V. L. Ryzkov. (Acad. of Sciences, U.S.S.R., Inst. of Microbiology, 1944. From *Pl. Bre. Abs.*, xvi., **1**, 1946, p. 42.) This work consists of three parts: (1) the general theory of filtrable viruses and their nature; (2) the description of the virus diseases of plants and methods of control; and (3) methods of investigation. The following chapters are of interest to plant breeders: Variability of phytopathological viruses. Serological diagnosis of virus diseases of plants. The classification of viruses and virus diseases. Physiological changes in virus diseases of plants. Methods of infection and epiphytology. Susceptibility and immunity to virus diseases in plants.

123. PLANT VIRUSES AND VIRUS DISEASES. By F. C. Bawden. (*Nature*, 10/2/45, p. 156.) This paper gives the substance of two lectures delivered at the Royal Institution on November 21 and 29. The author discusses the meaning of the term "virus disease," the manner in which infection takes place, the effects of such

diseases on plants, and what has been achieved by the successful application of the technique of protein chemistry to the purification of certain viruses.

124. Sobre a Queima do Algodoeiro no Nordeste. By J. A. Deslandes. (*Bol. Filossan. Min. Agr., Rio de Janeiro,* **1**, i., 1944, p. 3. From *Rev. App. Mycol.*, xxiv., **10,** 1945, p. 412.) In 1935 H. P. Krug first demonstrated the presence of *Fusarium vasinfectum* on cotton at the Textile Plant Experiment Station, Alagoinha, Parahyba, and by the end of 1940 281 foci of infection had been detected, and as far as possible eradicated, in that State and Pernambuco. The fungus is responsible for heavy losses, amounting to 95 per cent. of the crop in one test on the H.105 variety in severely contaminated soil. As the term " wilt " is inappropriate for the symptoms manifested and ambiguous, the author suggests that the disease should be termed " scorch." The pathogen appears to thrive in low-lying, cool, damp, fertile, slightly acid (*p*H 6·5 to 5·0) soils of light, sandy texture, with a good admixture of organic matter, and some clay, producing rapid and luxuriant growth of the host. Two other associated parasites active under such conditions are *Rhizoctonia solani* and the nematode *Heterodera marioni*. Analyses of the affected soils revealed an adequate potash content, and neither this nor any of the other mineral fertilizers tested effected any reduction in the incidence of *F. vasinfectum,* but beneficial results were obtained by the incorporation of stable manure into the soil. The climatic conditions of the north-east, with its frequent periods of heavy precipitation, are favourable alike to host and pathogen. *Abelmoschus* (*Hibiscus*) *moschatus* was shown to be an alternate host of *F. vasinfectum,* while other plants suspected of acting in the same capacity included *H. sabdariffa, Cassia tora, Crotalaria juncea,* and *Tephrosia nodiflora.* The occurrence of physiologic races is strongly indicated. The remnants of diseased plants in the soil constitute the chief source of inoculation. The pathogen may also be transmitted by the seed—probably only to a very slight extent—but even ten infected seeds in a sack of a herbaceous variety—*e.g.*, H.105—would suffice to maintain a corresponding number of foci in the soil of the new planting site; hence the need for stringent supervision of the seed. No indigenous varieties available at present combine desirable commercial qualities with resistance to the parasite. The arboreal forms, such as Moco, though less susceptible than the herbaceous, do not enjoy the immunity that has been claimed for them. To cite some examples from the results of three years' varietal tests, Pima, Giza 3 and 7, Sakha 4, Fouadi, Ashmouni, A. Jayawant C.5480, Indu, Tanguis, Rhyne's Cook 307, Dixie Triumph 37-1795, Toole 38-1781, I.A.7470-54480, and I.A.7387-54010 proved resistant (under 10 per cent. infection), while the following gave a satisfactory performance under field conditions: Dixie 14-5, Dixie 14-5 strain 2, Dixie Triumph 85, Acala Mead 2387, I.A.7470-54493, I.A.7387-52998, A.F.C.38-1295, A.F.C.38-1303, Coker wild strain 2, Delfos 6-102-11, American Red C.5510, A.F.C.42-34-1302, A.F.C.38-1299, R.U.438-1894, Delta and Pineland II A.38-1688-5, Delta and Pineland 10-38-1724, Rhyne's Cook, Acala Shaffer, Texas 7111-028, and U.44-438-1064 C.A. The problem of combating the cotton wilt due to *F. vasinfectum* is immensely complicated by the simultaneous presence in the affected regions of *Verticillium albo-atrum.* For the moment, a systematic campaign against *F. vasinfectum* is impracticable owing to the absence, on the one hand, of resistant varieties, and on the other of an organization for the control of seed production and distribution. Only the general sanitary precautions arising out of the foregoing observations can therefore be recommended.

125. Le Coton au Congo Belge. (*Bull. Agr. Congo Belge,* xxxii., **3,** 1941. Recd. 1945. From *Rev. App. Mycol.*, xxiv., **10,** 1945, p. 414.) In the part of this paper dealing with cotton diseases, it is stated that wilt, caused sometimes by *Fusarium vasinfectum* var. *gossypii*, and sometimes by *Verticillium albo-atrum,* appeared in the Uele area of the Belgian Congo some years ago; the outbreak has been checked, but the danger persists. The dispersal of native plantations will limit spread, but complete eradication is hardly possible. The only really effective method of control is the use or development of resistant varieties, such as Dixie Triumph. Stigmatomycosis of the bolls (*Nematospora coryli* and *N. gossypii*) can be controlled only by

the development of early resistant varieties, such as 145 Bambesa, which is almost immune in forest areas. Anthracnose of the bolls, due to *Colletotrichum* (*Glomerella*) *gossypii*, *Gloeosporium gossypii*, or *F. vasinfectum*, can be controlled by planting resistant varieties and avoiding an excess of nitrogenous fertilizers. Boll bacteriosis (*Bacterium malvacearum*) is not prevalent. The effects of damping-off (*Rhizoctonia solani*) can be palliated by earthing-up the plants. Where practicable, control can be effected by treating the soil ten days before sowing with ceresan, applied at the rate of 5 lb. per sq. m., at a concentration of 1 in 5,000; two days later the ground should be dug over to a depth of 20 cm. and again treated.

126. The Invasion of the Internal Structure of Cotton Seed by certain Fusaria. By B. A. Rudolph and G. J. Harrison. (*Phytopathology*, xxxv., **7**, 1945, p. 542. From *Rev. App. Mycol.*, xxiv., **12**, 1945, p. 502.) In the course of the writers' studies in California on the rôle of cotton seed in the dissemination of *Verticillium albo-atrum*, several species of *Fusarium* were isolated from apparently healthy seed, which must have harboured the species internally since delinting with acid precluded the possibility of survival on the exterior. In 1935 8·19 per cent. of the placentæ in bolls from plants infected with *Verticillium* wilt yielded *Fusarium*, and in 1936 7·37 per cent., though the plants showed no sign of disease except that they were more or less stunted. Seed from bolls with receptacles yielding *Fusarium* in culture was delinted and planted in the field on soil not known to have borne cotton crops before. Isolations from the steles of such plants showed 25 per cent. infection with *Fusarium* as against 19·81 per cent. for plants raised from so-called healthy seed, which evidently shows that *Fusarium* was present in much of that seed when planted. The *Fusarium* spp. reach the seed by way of the xylem, which they presumably occupy as saprophytes, since the plants display no pathological symptoms of any kind. The species so far identified are *F. moniliforme* (*Gibberella fujikuroi*), *F. oxysporum*, and *F. scirpi*, of which the last-named is capable of inducing a soft, brown rot of immature seeds.

127. North Carolina. Cotton Wilt Control. (*64th and 65th Ann. Rpts. N.C. Agr. Exp. Sta.*, 1940-41 *and* 1941-42. Recd. 1945. From *Rev. App. Mycol.*, xxiv., **10**, 1945, p. 405.) The use of resistant varieties of cotton is the only effective means of control of cotton wilt (*Fusarium vasinfectum*). Coker 4-in-1 is highly resistant and very productive, and Clevewilt, Wannamaker Stonewilt, and certain strains of Dixie Triumph have also proved very satisfactory in these respects. Coker 100 wilt-resistant does not withstand infection quite as well as 4-in-1, but its yields are approximately the same, and it may safely be planted on lightly infested soils. Liberal applications of potash are of some assistance, in conjunction with the use of resistant varieties, in combating the disease, which is most prevalent and destructive in the light, sandy soils of the Coastal Plain.

GENERAL BOTANY, BREEDING, ETC.

128. Genetics as a Tool for Studying Gene Structure. By S. Emerson. (*Ann. Mo. Bot. Gdn.*, **32**, 1945, p. 243. From *Pl. Bre. Abs.*, xv., **4**, 1945, p. 327.) Indirect evidence suggesting that the specificity of the gene resides in its unique surface configuration is discussed.

129. Genes as Physiological Agents. General Consideration. By S. Wright. (*Amer. Nat.*, **79**, 1945, p. 289. From *Pl. Bre. Abs.*, xvi., **1**, 1946, p. 33.) A useful review is given of present theories relating to the nature of the gene. The power of self-duplication is emphasized and it is thought improbable that it is to be accounted for by a succession of step syntheses; the alternative notion that the gene acts as a model on which further genic material is constructed is mentioned, and applied also to the problems of protein synthesis and cytoplasmic heredity. These ideas are considered in relation to the point of view which regards the organism as a whole as a self-regulatory system.

130. The Biological Basis of Individuality. By L. Loeb. (Chas. C. Thomas, Springfield, Illinois, 1945. $10.50. From *Pl. Bre. Abs.*, xvi., **1**, 1946, p. 107.)

From this lengthy review we give the following extracts: "The principal thesis of Professor Loeb's discussion is the theory that essential individuality in all organisms is the resultant of the presence, in all or almost all parts of the organism, of a definite chemical substance or complex of substances, the individuality differential. Analogous differentials are believed to characterize species and the higher taxonomic categories, also the component organs and tissues of each individual. These differentials are regarded not as genes, but as products derived from the activity of genes, and it is thought probable that they are proteins or conjugated proteins, perhaps associated with simpler compounds. . . . The origin of individuality and other differentials is explained along evolutionary lines. It is thought that there has been an evolutionary trend in the direction of increased differentiation of the individuality differentials and that this differentiation has become much finer in animals than in plants, or at least much more evident. Moreover, a comparable development is believed to accompany individual ontogeny, for the reactions used to investigate individuality differentials become more pronounced as the adult condition is approached. Special consideration is given to the connection between these ideas and the theory of fertilization in plants. Sexual fusion is regarded as analogous in some ways to transplantation, showing, however, in many instances, a tendency towards homoiofertilization—that is, conjugation between similar but genetically distinct individuals. The causes of self-sterility are analysed briefly, also the phenomena of heterosis and the depression often accompanying inbreeding. With regard to hybrid vigour, the author considers two suggestions, firstly the genetical explanation of complementary growth factors, and secondly a physiological explanation based on the Arndt-Schultz effect in which minute doses of a toxin (in this case the homoiotoxins derived from genetically different conjugants) act as stimulatory agents."

131. Are Gene Mutations responsible for the Growth Factor Requirements of Micro-organisms? By E. L. Tatum. (*J. Bact.*, **49**, 1945, p. 202. From *Pl. Bre. Abs.*, xvi., **1**, 1946, p. 38.) The theory is developed that specific genes are responsible for each step of the biochemical reactions of the cell, and that the mutation of these genes may result in the cell becoming heterotrophic for the constituents whose syntheses are catalysed by the enzymes determined by the original genes.

132. Plant Breeding and Genetics at the Imperial Agricultural Research Institute, New Delhi. By B. P. Pal and S. Ramanujam. (*Ind. J. Genet. Pl. Brdg.*, **4**, 1944, p. 43. From *Pl. Bre. Abs.*, xvi., **1**, 1946, p. 4.) Agricultural problems in India are discussed, and under the headings of interspecific hybridization, polyploidy, mutations, genetics of self-sterility, hybrid vigour, and vernalization, recent work is reviewed.

133. Soviet Genetics and the "Autonomy of Science." By L. Kartman. (*Sci. Mon.*, N.Y., July, 1945, p. 67. From *Pl. Bre. Abs.*, xvi., **1**, 1946, p. 25.) The author deprecates Polanyi's criticisms of the state of genetical research in the U.S.S.R. While believing that Lysenko represents a form of extremism in his breakaway from Mendelian genetics, it is thought that the research done by other geneticists in Russia is ample evidence for the flourishing state of genetics there.

134. Genetics of Two New Anthocyanin Patterns in Asiatic Cottons. By K. Ramiah and B. Nath. (*Ind. J. Genet. Pl. Brdg.*, **4**, 1944, p. 23. From *Pl. Bre. Abs.*, xvi., **1**, 1946, p. 14.) A description is given of two new alleles of the R_2 series which determines the variation and distribution of anthocyanin pigment in the vegetative parts of the plant and the presence or absence of the deep purple-red petal spot. These new alleles are (1) weak thumb-nail red spotted, designated R_2^{GS}, and (2) green spotless-2, designated R_2^{H0}. It is proposed to rename the allele R_2^{F0} defined by Silow and Yu green spotless-1. Both these new alleles have been found in the analysis of *G. arboreum* material. The results of various hybridizations indicate that the main phenotypic difference between the sun-red spotted alleles in *G. herbaceum* and *G. arboreum*—viz., the presence of non-pigmented stamen filaments and pigmented, respectively—is attributable to different modifier levels in the two

species. The origin of the two new anthocyanin patterns and other anomalous segregates is considered to be the result of mutation in a multiple allelomorphic gene rather than the result of crossing-over.

[*Cf.* Abstr. 477, Vol. XIX. of this Review.]

135. THE THEORY OF EVOLUTION FROM A BIOCHEMICAL POINT OF VIEW. By E. M. P. Widmark. (*Hereditas*, **31**, 1945, p. 383. From *Pl. Bre. Abs.*, xvi., **1**, 1946, p. 35.) A discussion of the question whether biochemical evolution can be traced in the comparative study of organisms, parallel to a reconstruction of evolution based upon morphological observations. The author finds no evidence from general biochemical data to support the concept of evolution in a phylogenetic sense.

136. UBER NEUERE STATISTISCHE METHODEN ZUR AUSWERTUNG VON KOPPELUNGSVERSUCHEN, VOR ALLEM IN DER PFLANZENZÜCHTUNG. By W. Ludwig and R. Freisleben. (*Z. Pflanzenz.*, **24**, 1942, p. 523. From *Pl. Bre. Abs.*, xv., **4**, 1945, p. 327.) The theory and application of the X^2 method for determining linkage in genetical experiments are described. It is stated that this paper is abstracted from a manuscript "Taschenbuch der modernen biologischstatistischen Methoden," which the senior author was prevented from publishing by the outbreak of war.

137. CHROMOSOME ATLAS OF CULTIVATED PLANTS. By C. D. Darlington and E. K. Janaki Ammal. (George Allen and Unwin Ltd., 1945. Price: 12s. 6d. net.) In a previous work, "The Handling of Chromosomes," by Darlington and LaCour, the technique of observing the machinery of inheritance was described. The "Chromosome Atlas" shows the results of applying that technique to the cultivated plants of the world. The chromosome numbers of some 10,000 species of the most useful plants, economic, decorative, and instructional, and of their wild relatives and ancestors, have been assembled; it constitutes in effect a world list of the known chromosome numbers of flowering plants. An introduction shows how these new discoveries—some original and most published since 1930—reveal the origin of cultivated plants and the means that are now available for their improvement. The importance of the chromosome numbers to the systematic botanist is clear from the new classification (undertaken in conjunction with authorities at Kew Gardens) which has been developed out of them and is now published as the basis of their arrangement. The popular names and economic applications are catalogued, and there is a full bibliography of over 850 names. The book should be of service for teaching and research in economic and systematic botany, horticulture, and plant-breeding. An index to families and genera is also included in the volume.

[*Cf.* Abstr. 485, Vol. XIX. of this Review.]

138. AN APPARATUS FOR THE GROWTH OF PLANTS UNDER CONTROLLED TEMPERATURE LEVELS. By H. Tint. (*Phytopathology*, **35**, 7, 1945, p. 511. From *Exp. Sta. Rec.*, **93**, 6, 1945, p. 692.) The apparatus described is said to permit investigation of plant development simultaneously at several temperature levels. The design allows temperatures in separate compartments to fluctuate within their respective levels in a manner resembling the normal diurnal range of temperature in the field under the influence of varying degrees of insolation. Details for construction are given; the cost of the materials is relatively low, and subsequent maintenance expenditures are negligible.

139. NOTIONS COMPARÉES DE FLUCTUATION ET DE VARIATION DANS L'AMÉLIORATION DES PLANTES. By L. Friedberg. (*Ann. Agron.*, **12**, Paris, 1942, p. 391. From *Pl. Bre. Abs.*, xvi., **1**, 1946, p. 34.) In this lecture fluctuation and variation, as exemplified in a pure line, are discussed for various plants under different genetical conditions. It is of the greatest importance in the study of evolution and in the practical science of plant breeding that variation and fluctuation should be clearly distinguished.

140. THE THEORY AND APPLICATION OF THE BACKCROSS TECHNIQUE IN COTTON BREEDING. By R. L. Knight. (*Jour. of Genet.*, **47**, 1, 1945, p. 76.) Backcrossing, though successful in other crops, has, in the main, failed to produce economic results in cotton. The use of the technique discussed in this paper has produced several commercially successful interspecific gene transferences. The following suggestions are made: The hybrid should be the male parent. The latest substrain of the back-

cross parent variety should be used each season as female parent to keep the crossing programme up to date. Where a large number of visible differences exist between the original parents, these provide a valuable basis for selection. In such a case large early backcross progenies should be grown and severe selection in the field utilized to accelerate the removal of the donor parent genotype. With few visible differences between the parents it is advisable to grow small backcross progenies and to concentrate on the elimination of the donor genotype by making as many backcrosses per year as possible. Selection of hybrid plants for further backcrossing should be made solely on (*a*) presence of transferred gene, and (*b*) vegetative similarity to the backcross parent. All characters likely to be due to heterosis should be avoided—e.g., longer lint or higher yield than the backcross parent. An arbitrary end-point in backcrossing should be avoided. The criterion should be a replicated test of bulk seed from heterozygotes from the backcross, against bottom recessives from the backcross, against the backcross parent as control. When the heterozygous bulk is qualitatively and quantitatively equal to the backcross parent, bulk propagation and large-scale testing should be started. Cumulative factors with only slight additive effect should be separated in backcrossing and recombined later. Linked factors are best separated to facilitate the elimination of the donor parent chromosomal segment between them. The appearance of blending inheritance in a first backcross need not discourage a plant breeder since inheritance of the character may still be mainly due to one or two major genes and clear-cut ratios may appear in later backcrosses. A method of bulk propagation from a backcross progeny via an out-of-season backcross F_2 to an F_3 homozygous propagation plot in the following season is discussed. A technique is suggested for transferring genes to a strain showing moderate heterogeneity.

141. Bruce's Explanation of Hybrid Vigour. By F. D. Richey. (*J. Hered.*, **36**, 1945, p. 243. From *Pl. Bre. Abs.*, xvi., **1**, 1946, p. 33.) Attention is drawn to the Mendelian explanation of hybrid vigour presented in a paper by Bruce in 1910, and the original paper is reproduced. In the writer's opinion, Bruce's paper merits recognition as the first comprehensive hypothesis explaining hybrid vigour as the interaction of dominant genes. It is thought that the two main objections to such an hypothesis—viz., the lack of skewness in the F_2 and non-recovery of the multiple homozygous dominant—have since been shown to be invalid by the work of Collins in 1921, that Bruce's theory is of general application, and that his formulae apply equally to the decrease in vigour upon selfing and the increase in vigour upon hybridization.

142. Growth and Phosphorus Accumulation in Cotton Flowers as Affected by Meiosis and Fertilization. By O. Biddulph and D. H. Brown. (*Amer. J. Bot.*, **32**, 4, 1945, p. 182. From *Exp. Sta. Rec.*, **93**, 5, 1945, p. 556.) The daily increments of dry matter, water, and phosphate to flowers and fruits in varying developmental stages were measured to furnish a continuous history of the net gain in each fraction as these organs matured. Variations in size of daily increment of dry matter followed the events of meiosis and fertilization. Maxima occurred at approximately 9 days after microsporogenesis, 11 days after megasporogenesis, and 16 days after fertilization; well-marked minima occurred between them. The daily increments of water to the developing flowers and fruits followed the same general pattern as for dry matter, but the ratio of dry matter gain to water gain was not constant. Calculations of the percentage of dry matter showed a gradual net hydration of the primordia up to the time of fertilization, then a more rapid hydration for about two weeks, after which dehydration of the fruit ensued. The daily increments of marked (radioactive) phosphate to the developing flowers and fruits were influenced to a lesser degree by the events of synapsis and syngamy; well-marked maxima and minima were absent, but gains appeared after each event. The percentage of marked phosphate delivered and that of total phosphate present (dry-weight basis) were highest in the young primordia, decreasing progressively thereafter until about 5 days before anthesis. Gains, especially in marked phosphate, were then recorded during anthesis; both fractions decreased after fertilization.

143. Absorption of Water by Plants. By P. J. Kramer. (*Bot. Rev.*, **11**, 6, 1945, p. 310. From *Exp. Sta. Rec.*, **93**, 5, 1945, p. 554.) This comprehensive review (273 references)—considering absorption mechanisms, factors affecting absorption, and water absorption in relation to other processes—is summarized as follows: "Intake of water apparently is brought about by two independent processes differentiated by Renner as the active and passive absorption processes. When soil moisture is abundant and transpiration slow, absorption often exceeds water loss, resulting in the development of positive pressure or 'root pressure' in the xylem. This pressure causes guttation and exudation phenomena. Since the absorption mechanism responsible for root pressure is dependent on the presence of active living cells in the roots, it is termed 'active absorption.' Some workers believe root pressure is caused by secretion of water into the xylem by the surrounding living cells. Others believe it is a relatively simple osmotic phenomenon caused by a difference in concentration of solutes in the xylem elements and in the solution surrounding the roots. Certain similarities between the conditions necessary for salt accumulation and for development of root pressure suggest that they are interrelated to the extent that the occurrence of active absorption and root pressure are at least partly dependent on the accumulation of salt in the xylem, and so indirectly related to metabolic activity and the permeability of the root cells. During periods of rapid transpiration or when soil moisture is deficient no root pressure occurs. Instead, the water in the xylem is under reduced pressure or even tension. This increases its diffusion pressure deficit and produces a gradient of increasing diffusion pressure deficit and decreasing pressure along which water moves from the external solution into the xylem. Since under these conditions the roots act simply as absorbing organs and water intake appears to be independent of any secretory or osmotic activity of the root cells, this type of water absorption is termed 'passive absorption.' Active absorption ordinarily can supply less than 5 per cent. of the water required by a rapidly transpiring plant. It does not occur from as dry soil nor from as concentrated solutions as does passive absorption of transpiring plants. Some species never exhibit any root pressure or other evidence of active absorption. It is, therefore, concluded that the root pressure or active absorption process is of negligible importance in supplying water to plants. The rate of absorption of water by plants in moist soil is determined primarily by the rate of transpiration. It is affected to a lesser degree by the extent and efficiency of the root system. Important environmental factors affecting absorption of water are the available moisture content of the soil, concentration of the soil solution, soil aeration, and soil temperature."

144. Studies in the Periodic Partial Failures of the Punjab-American Cottons in the Punjab. XIII. Manuring of Cotton. By R. H. Dastur and S. Singh. (*Ind. J. Agr. Sci.*, xiv., **5**, 1944, p. 325.) An account of the practical aspects of cotton manuring based on the results of the numerous experiments distributed over the important American-cotton-growing tracts of the province. These results are shown by means of the following tables: Table I: (A) Experiments in which the response to sulphate of ammonia was high and profitable; (B) in which the response was low and unprofitable. II. Increase in yield with the sulphate of ammonia under different varieties, and its relation to their yielding capacity. III. Variation in yield response to the sulphate of ammonia with changing sowing date. IV. Effect of phosphorus and potash on the yield of cotton. V. Effect of farmyard manure and berseem green manure on the yield of cotton. VI. Comparative effects of ammonium sulphate and oil-cakes on the yield of cotton. VII. Statement of "tannin tests" made and the results obtained. The "tannin test" is described.

XIV. Mineral Metabolism of Normal and *Tirak*-affected Plants. By R. H. Dastur and A. Ahad. (*Ind. J. Agr. Sci.*, xv., **2**, 1945, p. 63.) A study of the mineral uptake of normal plants and of *tirak*-affected plants on the two soil types, (*a*) light sandy soil deficient in nitrogen, and (*b*) soil with saline subsoil, was carried out to determine whether a deficiency of any important mineral was associated with

immaturity of seeds in *tirak*-affected plants. Detailed investigations of the chemical composition of leaves and bolls of normal and *tirak*-affected plants at different stages of development on the two soil types have revealed a deficiency of potash at the fruiting stage in the affected cotton plants. . . . The deficiency of potash in light sandy soils occurred as an indirect result of a deficiency of nitrogen. On saline soils potash deficiency probably resulted from the development of a condition of physiological drought, during which the absorption of water and nutrients was reduced. When this condition was prevented in such soils by changing the time of sowing from May to June the uptake of nutrients, of which potash was one, was found to be normal. The leaves of the late-sown cotton did not droop, and the seeds and bolls matured properly.

XV. FORMATION OF PROTEINS, OIL, AND CELLULOSE IN THE BOLLS OF NORMAL AND *Tirak*-AFFECTED PLANTS. By R. H. Dastur and A. Ahad. (*Ind. J. Agr. Sci.*, xv., **2**, 1945, p. 75.) The results of the investigation indicated that proteins and oil in seeds and cellulose in lint were formed from carbohydrates. The reducing sugars appeared to be the main carbohydrate utilized in the formation of protein and oil in seeds and of cellulose in lint, since this kind of sugar declined in carpels, seed, and lint as development proceeded. The starch and disaccharides found in the carpels and seeds may be regarded as temporary storage products resynthesized from reducing sugars. These higher forms of carbohydrates appeared to be reconverted into reducing sugars as the latter were being utilized in synthesis of protein and oil. The cellulose content of the lint from normal plants was higher than that of the lint from *tirak*-affected plants, this being due to a decrease in the secondary thickening of the fibre in the latter, with a consequent reduction in strength.

145. COLCHICINE ET POLYPLOIDIE. By L. Decoux and L. Ernould. (*Publ. Inst. Belge Amelior.* **11**, 1943, p. 363. From *Pl. Bre. Abs.*, xvi., **1**, 1946, p. 36.) A review of the literature is given, including a list of 510 titles and a useful glossary.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

146. COMBING: ADVANTAGES. By E. H. Helliwell and H. J. Ball. (*Text. World*, **95**, 5, 1945, pp. 112, 202. From *Summ. Curr. Lit.*, xxv., **21**, 1945, p. 480.) The authors summarize the advantages of combing for improving the strength and appearance of cotton yarns, and give typical comparisons of carded and combed yarns. A method is described for counting neps and specks in laps, slivers, and rovings, the main apparatus being glass plates ruled in half-inch squares.

147. COTTON FIBRE: RELATION OF IMPERFECTIONS TO NEPS AND YARN QUALITY. By G. J. Harrison and E. E. Craig. (*Text. Res. J.*, **15**, 1945, p. 247. From *Summ. Curr. Lit.*, xxv., **21**, 1945, p. 491.) Common imperfections occurring in cotton fibres are described. The responsible growth factors are considered and the relations between fibre imperfections and neppiness are examined. Several hundred neps were analysed and found to consist of ten different elements. More neps contained immature fibres than any other element. Extreme tapering, fibre roughness, fibres of large diameter, and deformities are factors that contribute to neppiness and thus to spinning difficulties in greater proportion than their prevalence in cotton would indicate. Seed coat particles and fuzz hairs are of common occurrence in neps. Fibre fragments found in neps are probably a product of the various handling operations.

148. COTTON FIBRE: RELATION OF PROPERTIES TO STRENGTH OF CARDED YARN. By R. W. Webb and H. B. Richardson. (*U.S. Dpt. Agr., War Food Admin., Off. of Marktg. Services, Prel. Rpt.*, 1945. From *Summ. Curr. Lit.*, xxv., **21**, 1945, p. 491.) This report is the first in a series of studies on the relationships between cotton fibre properties, behaviour in processing, and yarn and fabric qualities. Data are provided on the fibre properties of 766 cottons covering a wide range of American Upland types and conditions of growth, and on the lea strengths of 22's and 60's yarns spun from them without combing. Multiple, partial, and simple correlation analyses are recorded so as to reveal the contribution of various fibre properties, separately and

in combinations, to the lea strength. The results demonstrate that the properties rank in decreasing order of importance thus: fibre strength, length variability, upper quartile length, fineness, grade, and percentage of mature fibre in the sample. In 22's these six properties together account for 87 per cent. of the total variance of lea strength and the correlation coefficient between them and lea strength is $0{\cdot}935 \pm {\cdot}006$. In 60's the correlation coefficient is $0{\cdot}937 \pm {\cdot}006$. Some 66 regression equations, involving different combinations of fibre properties, are presented, by means of which the strength of a carded yarn can be calculated from some of the fibre data. The correlation coefficients are nearly as great as those for the six properties above, if only the first four properties are considered.

149. COTTON FIBRE: RELATION OF PROPERTIES TO STRENGTH OF TYRE CORD. By R. W. Webb and H. F. Richardson. (*U.S. Dpt. Agr., War Food Admin., Off. of Marktg. Services, Prelim. Rpt.*, 1945. From *Summ. Curr. Lit.*, xxv., **21**, 1945, p. 492.) Data are provided on the fibre properties of 377 American Upland cottons of known history and grown in duplicate, which were used for the production, by standard practice, of 23s/5/3 carded tyre cord. Multiple, simple, and partial correlations of the data are used to determine the contribution of fibre properties, separately and in various combinations, towards the breaking load, elongation under a 10-lb. load, and elongation at break of the cords. A coefficient of multiple linear correlation of 0·920 is found for the relationship between cord strength and the group of six fibre properties—upper quartile length, coefficient of length variability, strength, fineness, percentage of mature fibre, and grade. These six properties account for 84·6 per cent. of the total variance of cord strength. Nearly the same degree of correlation was found for the single properties—fibre strength, fineness, coefficient of length variability, and grade. Only fibre strength and fineness significantly influence the elongation of the cord under a 10-lb. load, but coefficient of length variability and grade also affect elongation at break. Each 1 per cent. increase in cord elongation under a 10-lb. load is accompanied by a reduction of 0·58 lb. in breaking load; a 1 per cent. elongation at break is associated with an increase of 0·08 lb. A small but significant negative correlation is shown between cord strength and elongation under 10-lb. load, and an insignificant positive correlation between cord strength and elongation at break. The coefficient for the correlation between the two elongations is $\pm 0{\cdot}871$. A coefficient of $\pm 0{\cdot}897$ is found for the correlation between cord strength and lea strength of the 23's single yarn spun with optimum twist factor, and 80 per cent. of the variance in cord strength is accounted for by the strength of the singles yarn. In fact, an equation is given whereby the strength of the tyre cord can be predicted from the lea strength of the singles.

150. SOME CALCULATIONS RELATING TO THE ARRANGEMENT OF FIBRES IN SLIVERS AND ROVINGS. By G. A. R. Foster *et al.* (*J. Text. Inst.*, xxxvi., **12,** 1945, T311.) In the course of researches on cotton spinning it became necessary to make a number of calculations concerning the arrangement of the fibres in slivers and rovings, and the effect of the arrangement on the thickness of the roving and on the composition and weight of tufts drawn or cut from it. These calculations are collected together in this paper with a few practical examples of their application. In the mathematical treatment it is necessary to make certain simplifying assumptions, such as that the fibres are straight and parallel to the axis of the sliver, and that they are perfectly controlled by the machinery. Since these conditions are not satisfied in practice, it is not surprising that there are considerable quantitative differences between calculated and observed results. In spite of this the theory gives a useful picture of the arrangement of the fibres and has led to the discovery of new knowledge. In most cases there is little to be gained at present by extending the mathematics to rovings in which the fibres are not parallel. In the last section, however, two methods of measuring the degree of parallelization are suggested, and these may form the basis of a more complete theory should this prove necessary in the future.

151. THE BLEACHING OF CELLULOSE IN LINTERS. By L. Thoria. (*Tech. Bull.*, Ser. B, No. 33. Ind. Cent. Cott. Comm., 1944.) The principal factors affecting the

bleaching process are: The hydrogen-ion concentration of the hypochloric liquor[1-4]; the duration of bleaching; the concentration of available chlorine in the bleaching liquor. The effect of each of these three factors on the conduct of bleaching is discussed.

152. Cotton Linters: Determination of Foreign Matter Content. (*Fibres*, **6**, 1945, p. 43. From *Summ. Curr. Lit.*, xxv., **18**, 1945, p. 408.) A method of determining the amount of foreign matter in cotton linters is described which involves heating a weighed sample to 115°C. in a porous earthenware vessel impregnated with concentrated hydrochloric acid, breaking up the fumed material, brushing through a 50-mesh sieve and weighing the material which does not pass through. This is the foreign matter and it can be examined by passing consecutively through sieves of increasing fineness by means of which it may be fractionated into fine and coarse hull, seed, boll, stems, etc. Some typical results are presented, and the advantages and disadvantages of this method, compared with visual examination by experts, are discussed.

153. Cotton Operatives: Training. (1) By A. H. Seymour. (2) By J. Baines. (*Text. Merc. and Argus*, **113**, 1945. From *Summ. Curr. Lit.*, xxv., **16-17**, 1945, p. 396.) Reports are given of lectures and discussions at a conference on the "Training of Operatives, with Special Reference to Cotton Spinning," under the titles (1) Training for Industry, (2) Cotton Labour Training Problems and their Solution.

154. Shirley Institute: Relation to Lancashire Spinning Industry. (1) By L. H. C. Tippett. (2) By S. Taylor. (*Text. Wkly.*, **36**, 1945, pp. 892, 978. From *Summ. Curr. Lit.*, xxv., **23-24**, 1945, p. 560.) Reports are given of addresses on the work of the spinning, liaison, and information departments of the Shirley Institute.

155. Cotton: Production and Spinning Quality. By J. H. Dawson. (*Ind. Text. J.*, 1943-4, **54**, 1944-5, **55**. From *Summ. Curr. Lit.*, xv., **19**, 1945, p. 425.) A useful review, under the title "Cotton Spinning," of the growth and structure of the cotton fibre, its chemistry, types, and staples, grading and stapling, instruments for stapling, the characters of Indian cottons, ginning and baling, practices on the raw cotton market, power problems and machine driving, the reception and classing of bales at the mill, opening, and mixing.

156. American Opening and Carding Departments: Organization. Textile Operating Executives of Georgia. (*Text. World*, **95**, 8, 1945, p. 109. From *Summ. Curr. Lit.*, xxv., **21**, 1945, p. 480.) A summary of replies from 26 mills in Georgia to a questionnaire on the following subjects: (1) The types of opening and cleaning machines used, with notes on the "curling" of the cotton by some of them, and on changes the mills would make if possible. (2) The types of scutcher beaters used and their speeds. (3) Practices followed in stripping and grinding the cards; the answers reveal a wide diversity of opinions, with a trend towards continuous stripping. (4) The effects of card output on yarn strength; most replies indicate an improvement in yarn appearance, but not in strength, as the result of reducing the rate of production. (5) The effect of card draft; some mills advocate increasing the draft; one mill gives a comparison of the variability in card sliver, draw-frame sliver, roving, yarn count, and cloth strength as between a draft of 110 and one of 220 on a double lap. (6) The use of ball bearings on lickers-in and comb boxes and of bottle oilers on cylinder, doffer, and licker-in shafts; most replies do not favour these practices. (7) The use of endless composition belts for driving the licker-in and comb box. (8) Single or double drawing and roving processes; a diversity of opinions is revealed. (9) The use of revolving top roller clearers on drawing and fly frames; most replies recommend them. (10) Creeling a high-draft speed frame and using the odd lengths of draw-frame sliver. (11) The use of compression rollers for increasing the amount of card or draw-frame sliver per can; most replies are favourable.

157. Cotton: Selection for Carding and Spinning. By E. H. Helliwell. (*Text. World*, **95**, 4, 1945, pp. 118, 192. From *Jour. Text. Inst.*, xxxvi., **9**, 1945, A363.) Advice is given on the selection of cotton, with reference to staple, proportion of

short fibre, and grade. The importance of good carding is stressed, and it is suggested that the carder should collaborate with the buyer in the selection of cotton. A table is given of suitable staples for spinning warp and weft, carded and combed qualities, in various ranges of count up to 100's. Another table reproduces the Sheldon figures for lea strengths of carded warp yarns spun in counts 10-30 from cottons of $\frac{7}{8}$ to $1\frac{3}{8}$ in. staple.

158. THE INVESTIGATION OF PERIODICITIES IN THE PRODUCTS OF COTTON SPINNING. THE DRAFTING WAVE. By G. A. R. Foster. (*J. Text. Inst.*, xxxvi., **9**, 1945, T229.) A discussion of the subject under the following headings: Introduction and Summary; Periodic Irregularities due to Floating Fibres; Periodic Irregularities in Drafted Products; The Form of the Drafting Wave; The Measurement of the Drafting Wave; The Cause of the Drafting Wave.

159. COTTON SPINNING MILL: MANAGEMENT. By H. L. Pratt. (*Text. World*, **95**, **4**, 1945, pp. 113, 192. From *J. Text. Inst.*, xxxvi., **9**, 1945, A363.) Practical advice is given on the following topics: Selection of cotton; travellers; roller covering; draft and twist; atmospheric conditions; laboratory tests and control; and observations of "ends down."

160. DEVELOPMENT OF MILDEW-RESISTING COTTON IN THE U.S.A. (*Cotton*, M/c, 25/8/45.) A new type of cotton fabric which resists mildew and other agencies causing decomposition has been developed in the Southern Regional Research Laboratory in New Orleans. It is called acetylated cotton, and is made by a process somewhat similar to that used in making rayon by the cellulose acetate process. The new cotton has the appearance and strength of ordinary cotton, but is highly resistant to micro-organisms. When buried in the ground under conditions which cause ordinary cotton to disintegrate in one week, the new cotton is almost unaffected after six months to one year. Exposed to the elements it is intact after two years. Whereas a potato-bag made of ordinary cotton decomposes rapidly if there is one spoiled potato inside, the new bag is unharmed. The new cotton is available as cloth, yarn, or thread, and is expected to be used for clothing that will not mildew, tents and awnings that will not rot, and for fish-nets that can be put away wet. It contains no toxic substance, which is important in the making of bags for food.

161. TESTING FABRICS FOR RESISTANCE TO MILDEW AND ROT. By P. B. Marsh *et al.* (*Tech. Bull. U.S. Dpt. Agr.* 892, 1945. From *Rev. App. Mycol.*, xxiv., **10**, 1945, p. 428.) A simple apparatus is described for the exposure of mildew-proofed fabrics to water-leaching under controlled conditions. Several fungi, including species of *Trichoderma*, have been found capable of tendering treated fabric of a higher copper content than that attacked in similar trials by the common test organisms, *Chætomium globosum* and *Metarrhizium*. *C. globosum*, however, appears to be the most satisfactory organism for use in tests on non-sterile fabric. . . . A culture procedure is described in which the test fabric is planted on a mat of mycelium growing on a filter-paper strip supported on a salt agar medium. Used in this way, *C. globosum* attacked treated materials much more severely than when applied by the pipette-inoculum method. The presence of independently nourished mycelial inoculum, capable of repeated infection of the strip at many points, is believed to simulate in part the highly exacting conditions of soil burial. . . . Of a number of preservatives tested, 2,2′-dihydroxy-5,5′-dichloro-diphenylmethane was shown to possess exceptional fungicidal properties, while copper naphthenate has proved consistently more effective per unit weight on fabric than various other copper compounds used in the experiments.

162. THE DETERIORATION OF COTTON FABRIC BY CERTAIN MICRO-ORGANISMS. By D. Klemme *et al.* (*Circ. U.S. Dpt. Agr.* 737, 1945. From *Rev. App. Mycol.*, xxv., **1**, 1946, p. 40.) Out of 43 fungal isolates studied for their capacity to cause loss of breaking strength in an 8-oz. bleached cotton duck fabric after a week's incubation on a liquid mineral-salt medium with ammonium nitrate as a nitrogen source, 24 were responsible for over 50 per cent. tendering. The heaviest reductions were caused by three strains of *Metarrhizium glutinosum* (97, 94, and 84 per cent.), *Stachybotrys atra* (88), *Chætomium globosum* (86), *Trichoderma* sp. (86), *Thielavia*

terricola (81), *Cephalosporium* sp. (81), and *Fusarium oxysporum* (73). The one bacterium, *Spirochœta cytophaga*, included for comparative purposes, decreased the strength of the fabric by 76 per cent. on the same medium. *Chœtomium globosum*, 12 isolates of *Fusarium*, the above-mentioned three of *M. glutinosum*, and *S. cytophaga* were also grown on mineral salts media containing (1) sodium nitrate and (2) ammonium dihydrogen phosphate as nitrogen sources, while a species of *Hormodendrum* was cultured on the former only. In general, the *F.* isolates brought about the maximum amount of deterioration on the ammonium phosphate substratum and the minimum on the sodium nitrate, while those of the other genera and the bacterium were most destructive on the ammonium nitrate nutrient. *C. globosum*, however, proved to be an exception in this respect, causing the most extensive loss on the sodium nitrate medium. The results of the study indicate a specific relationship between the nutritive reactions of the majority of the organisms utilized and their ability to tender fabrics, within which limitations they are adaptable for experimentation.

163. Rotproofing Cotton Fabrics. By C. H. Bayley and M. W. Weatherburn. (*Canad. Text. Jour.*, lxii., **5**, 1945, pp. 34, 36, 46. From *Rev. App. Mycol.*, xxiv., **9**, 1945, p. 380.) A tabulated account is given of an investigation conducted at the National Research Laboratories, Ottawa, on the copper naphthenate tolerance of the cellulose-destroying fungi, *Chœtomium globosum*, *Metarrhizium glutinosum*, and *Aspergillus niger*, and of the effect of mercuric naphthenate on *A. niger* and a *Penicillium* isolated from orange-coloured areas on copper-treated cotton fabrics subjected to the standard soil burial test. The culture medium and method of inoculation were those prescribed by Thom *et al.* The trial samples, consisting of pieces of light cotton sheeting 1 in. square, were immersed in copper naphthenate solutions at concentrations ranging from 0·005 to 0·8 per cent. and incubated at 30°C. All the organisms were capable of growth at the lower copper dosages. *C. globosum* was partially and totally inhibited at 0·1 and 0·3 per cent. respectively, and *M. glutinosum* at 0·07 and 0·5 respectively, whereas *A. niger* continued to develop freely at 0·8. Another series of experiments was carried out to determine the effects of leaching, artificial weathering, waterproofing wax, and 25 per cent. mercury-containing mercuric naphthenate on the growth of *A. niger* and the above-mentioned species of *Penicillium* on a copper naphthenate-treated No. 8 cotton duck fabric. Both organisms grew readily on the copper naphthenate-treated samples even in the presence of wax, whereas the development of *A. niger* was brought to an almost total standstill by 0·03 per cent. mercuric naphthenate, and completely inhibited at 0·1, the latter concentration also entirely arresting the growth of the more resistant *Penicillium*. Considerable loss in breaking strength was registered in the untreated and leached (for 24 hours) and weathered (400 hours in a weatherometer), copper naphthenate-treated samples attacked by the *Penicillium*, which was not repelled by the inclusion of waterproofing wax (a mixture of paraffin wax and No. 2 petrolatum grease, 3 : 1) in the solution, but the addition of increasing amounts of mercuric naphthenate obviated this defect to some extent.

164. The Soil Burial Test for Rotproofed Cotton Fabrics. By J. D. Dean *et al.* (*Amer. Dyest. Rptr.*, xxxiv., **10**, 1945, p. 195. From *Rev. App. Mycol.*, xxiv., **8**, 1945, p. 331.) In the writers' experiments with copper naphthenate-treated osnaburg, a well-protected sample weighing 6-8 oz. per sq. yd. was found to withstand three weeks' burial in fresh soil before undergoing significant deterioration, and for a satisfactory determination of resistance it is preferable to extend the trial period until strength loss amounts to roughly 80 per cent. of the original (average of six weeks). The soil-burial method must thus be definitely placed in the long-range category of evaluation tests, and as yet no high degree of scientific exactitude can be claimed for it. From the practical standpoint, however, it has given reasonably dependable results, the available data indicating that treatments consistently showing high resistance numbers in soil-burial tests make the best records in service performance.

165. Textile Terms and Definitions. (*J. Text. Inst.*, xxxvi., **10**, 1945, p. 151.)

Lists of definitions and notes approved for publication by the Textile Terms and Definitions Committee. The lists will be reconsidered later in the light of comments and criticisms that might be received, before the definitions in their final form are adopted.

[*Cf.* Abstr. 277, Vol. XXII. of this Review.]

166. COTTON TEXTILES: DEVELOPMENT FOR WAR. By H. Y. Robinson. (*Man. Cham. Comm. Mthly. Rec.*, **56**, 1945, p. 144. From *Summ. Curr. Lit.*, xxv., **20**, 1945, p. 451.) A short review is given of the contribution of cotton textiles to the British war effort. Reference is made to flying suits for the Arctic made of special material developed by the Shirley Institute.

167. PROOFING TEXTILES AGAINST ROT, MOULD AND MILDEW. By M. Hopley and J. R. F. Jackson. (*Text. Rec.*, lxiii., **749**, 1945, pp. 41, 59. From *Rev. App. Mycol.*, xxiv., **10**, 1945, p. 427.) Shirlan (salicylanilide), developed by the British Cotton Industry Research Association, is an extremely effective anti-mildew agent for cotton, linen, and woollen textiles, being colourless, odourless, non-volatile, and non-toxic. Among potential alternatives to shirlan, thallium carbonate is perhaps the best, but its cost is prohibitive for mildew-proofing. The chlorinated phenols are too volatile to afford more than temporary protection, while the nitrophenols turn the fibre yellow; both groups, moreover, are toxic and liable to cause dermatitis. Organo-mercurials are unstable in the presence of other metals, and therefore ill adapted to application on ordinary textile machinery, while their fungicidal activity is also reported to be inhibited by contact with certain sulphur compounds. Other mildew-proofing substances beginning to find favour include Product VF (mercapto-benzthiazole) and 2: 2′-dichloro-5: 5′-dihydroxydiphenylmethane, but they seem unlikely to displace shirlan to any great extent at the moment. Rotproofing processes based on chromium are highly resistant to weathering. The simplest form of chromium treatment is the so-called "chrome tinting," involving impregnation with basic chromium sulphate or acetate, followed by after-treatment with alkali, and sometimes with copper sulphate. The resistance of chrome-tinted cotton to micro-organisms is comparable to that of ordinary mineral khaki-dyed material.

168. TEXTILES: MOULD AND BACTERIAL ATTACK; INCIDENCE AND CONTROL. By R. G. Fargher. (*J. Soc. Dyers and Col.*, **61**, 1945, p. 118. From *Summ. Curr. Lit.*, xxv., **15**, 1945, p. 351.) A discussion of cotton as a medium for growth of micro-organisms, mildew-proofing of yarns and fabrics, the results of examinations of mildew antiseptics and the properties sought in such preparations, causes of incomplete protection, the requirements of an ideal rot-proofing agent, the behaviour of cotton during exposure to the weather, the use of Cu and Cr compounds as rot-proofing agents and problems arising in their use.

169. TERMITE-RESISTANT TEXTILES: TESTING. By G. Becker. (*Textilberichte*, **23**, 1942, pp. 523, 573. From *Summ. Curr. Lit.*, xxv., **16/17**, 1945, p. 380.) Attack on six acetate and viscose rayons, cotton, and plastic-impregnated fabrics by starved and fed *Calotermes flavicollis*, Fabr. (20 nymphs and 10 workers per 5×5 cm. of sample), were measured in terms of the average surface area of the sample destroyed (A) and the mean number of surviving termites (S). Results are tabulated for 24° and 80 per cent. R.H., 24° and 97-98 per cent. R.H., 28° and 80 per cent. R.H., and 28° and 97-98 per cent. R.H. The average S values for all the samples were 23, 18, 15, and 4 after exposure for 4 weeks, and 14, 13, 6, and 1 after 8 weeks. The increasing order of A was cotton, acetate, viscose, plastic-impregnated fabrics for termites fed on filter paper and mould mycelia. The value of A for hungry termites was much greater than for fed termites; the order was cotton, acetate, plastic-impregnated, viscose, but A for cotton and acetate rayon were similar. The major part of the destruction occurs in the first 4 weeks. A fabric is to be regarded as termite-resistant if there is little or no visible attack on a 5×10 cm. sample by 120 insects after 8 weeks under tropical conditions of temperature and R.H.

ADDENDA.

170. ARGENTINE COTTON CROP. (*Cotton*, M/c, 16/2/46.) The Ministry of Agriculture published in January 1946 its final estimate of the 1944-45 cotton crop as 72,014 metric tons, compared with 119,921 tons in 1943-44. The report attributes the decline in production to drought and pests.

171. BRAZILIAN COTTON EXPORTS, 1945. (*Cotton*, M/c, 2/3/46.) According to unofficial returns 159,550 tons of cotton were exported through Santos during the complete year 1945; these figures are the highest since 1941, when 254,012 tons were shipped.

172. EGYPTIAN COTTON CROP, 1946-47. (*Cotton*, M/c, 2/3/46.) The Alexandria Commercial Co. reports in February that owing to the record mild winter with very little rainfall and wind, conditions have been very favourable for land preparation, and it is expected that sowing will commence in the South and Central Delta regions during the second half of February. It is anticipated that Menoufi will gain considerable ground at the expense of Giza 7 and Karnak, and that some 100,000 feddans will be planted with this variety, compared with 38,500 feddans last season. The acreage planted to Zagora in the South Delta may also be increased. About 10,000 feddans will be planted with the newcomer Giza 30, and a slight increase over the 2,839 feddans planted with Amoun last year is expected.

173. GERMAN TEXTILE INDUSTRIES. (*Int. Textiles*, **1**, 1946, p. 102.) The statistics given cover the Northern (Hanover, Rhineland and Westphalia) and Southern (Hessen, Bavaria, Baden and Würtemberg) Zones; data for the Eastern Zone, occupied by the Russians, are not at present available. In the two zones 2,106,606 (29 per cent.) cotton spindles were destroyed and 42,306 (28 per cent.) cotton looms; the rayon and silk weaving industry sustained a loss of 11,076 looms (32 per cent.). The greatest damage, however, was to the wool-textile industry; losses totalled 718,076 (61·5 per cent.) woollen and worsted spindles, and 10,658 (68 per cent.) woollen looms. In addition to war damage, loss of machinery has occurred through exposure and looting. The following estimates are of machinery in place in the Northern and Southern Zones: 5,266,000 cotton spindles and 110,870 cotton looms; 24,128 rayon and silk looms; 452,100 woollen and worsted spindles and 5,050 woollen looms. It is not easy to estimate the length of time required to restore the textile industry to effective operation; the primary need is for raw materials, not to mention coal and transportation.

174. ECONOMIC RECOVERY OF THE NETHERLANDS. (*Int. Textiles*, **1**, 1946, p. 102.) *Cotton-textile industry.* The effective spindleage of the Netherlands cotton-textile industry is estimated at 955,520, which represents a fall of 23 per cent. from the pre-war figure of 1,240,441; about 11 per cent. of the total was completely destroyed; the repair of the remainder awaits a supply of parts. There are 21 spinning mills in the country, more than two-thirds of which are located in the extreme eastern part; six of them are known to have suffered severe damage. The weaving section comprises about 100 mills, with a total of 50,000 looms; about 86 per cent. are intact, and 6 per cent. can be repaired rapidly. Some of the spinning mills also weave cloth. During the occupation 80 per cent. of the industry was closed down; the rest operated on a very small scale, using rayon staple supplied by Germany. It is estimated that the industry could use about 225,000 bales of cotton annually; in pre-war years consumption was about 220,000 bales (48,000 tons) per annum; some 20,000 tons of yarn were imported from England, Belgium and Czechoslovakia. The estimate of the Netherlands Spinners' and Weavers' Association, at 304,000 bales for the first year, is even higher; this takes into account an estimated 20,000-40,000 bales to replace "operating stock" which the Germans stripped from the machines. Other requests are for 1,500 tons of linters; 1,500 tons of comber waste or card strips; 3,000 tons of fly waste; and 1,000 tons of sweeping waste. An estimated 11,000 tons of yarn are required for knitting, weaving, and the manufacture of hosiery.

175. A NOTE BOOK OF TROPICAL AGRICULTURE. By R. Cecil Wood. (Third Ed., 1945. Obtainable from the Editor, Imperial College of Trop. Agric., Trinidad. Price 10s. 6d. From *Trop. Agr.*, xxii., **12**, 1945, p. 232.) The third edition of this popular little book has recently been issued. Its contents do not differ much from the two previous editions except for a few alterations and for the section on soils, which has been revised. The contents cover many aspects of tropical agriculture which will be useful to planters and agricultural workers generally. Among the various subjects dealt with may be mentioned the weights and measures of different countries, the construction of buildings and roads, and the use of agricultural machinery. This is followed by many facts and figures on tropical crops and on manures, foods and feeding, and livestock.

(*Cf.* Abstr. 416, Vol. X., and 754, Vol. XIV. of this Review.)

176. THE DIAGNOSIS OF MINERAL DEFICIENCIES IN PLANTS BY VISUAL SYMPTOMS. A COLOUR ATLAS AND GUIDE. By Dr. T. Wallace. (Supplement, 1944, H.M. Stat. Off., 5s. net. From *Nature*, 9/2/46, p. 145.) Much attention has been given during the present century to the effect of mineral deficiencies on plant growth, and more recently it has become apparent that the presence of minute traces of new elements are of equal importance. This colour atlas deals with the visual diagnosis of deficiencies of those minerals which have long been known to be essential for plant growth; with the addition of a few trace elements such as boron, manganese, and molybdenum, the importance of which has been discovered in more recent years. It forms a supplement to the original work on "Mineral Deficiencies in Plants" published in 1943.

The ninety-four colour plates are, in the main, of good quality and contain information regarding a number of additional crops including flax, broadbean, red clover, lucerne, lettuce, leek, celery, pear, plum, etc., and further deficiencies are illustrated for other crops already included in the main edition. The effect of nitrogen deficiency is shown for a number of crops, including wheat, flax, vegetable and fruit crops. Very little is known yet concerning the function of the long-recognized essential elements which are required for plant growth. The discovery of a large number of trace elements which are necessary for normal growth of many species of higher plants and of fungi has raised new problems in plant nutrition, and in view of the continued need for a high level of production of home-produced foodstuffs it is essential that attention should be given to every factor that may reduce crop yield.

177. EXCESSIVE FIELD EXPOSURE COUPLED WITH DRYNESS OF LINT MAY BE RESPONSIBLE FOR DIFFICULTIES WITH "IRRIGATED" COTTON. By R. S. Hawkins. (*Arizona Sta. Mimeog. Rpt.* 79, 1945. From *Exp. Sta. Rec.*, **94**, 2, 1946, p. 190.) Data obtained during recent years indicated that variations in irrigation within rather wide limits do not cause as great differences in such factors as cotton fibre length and strength as do seasonal differences, probably climatic. Arizona cotton is left in the field for longer periods after opening than anywhere else in the United States. Shortage of labour has been the cause of this unsatisfactory situation; machine harvesting may be the answer to the problem. Excessive field exposure evidently is accompanied by excessive drying of the fibres, and the lint is still too dry for good spinning when it gets to the mill. "Timely harvesting would go a long way toward remedying this situation, and the installation of moisture-adding devices in the gins of the arid Southwest might further correct the difficulty."

178. VIABILITY AND INFECTION OF LIGHT AND HEAVY COTTON SEEDS. By C. H. Arndt. (*Phytopathology*, **35**, 10, 1945, p. 747. From *Exp. Sta. Rec.*, **94**, 2, 1946, p. 206.) Seeds of Upland cotton were acid-delinted and separated into floaters and sinkers on the basis of their specific gravity relative to water. The floaters comprised 4 to 94 per cent. of the total seed weight; their relative proportion was determined more by varietal characteristics than by viability of the seed, internal fungus infection, or crop year. Varieties with high seed weights tended to have the greatest percentages of floaters; removal of occluded air changed most of them to sinkers. The viability of the floaters tended to be less than that of the sinkers when the proportion of floaters was small; when the percentage of floaters exceeded that

of the sinkers, the viability of both was about the same. The general applicability of water-grading to improvement of seed quality in cotton is considered questionable.

179. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The twenty-sixth number of Series A, Genetics, will be published shortly, and will contain the following papers reprinted from the *Journal of Genetics*:

THE GENETICS OF "CORKY." I. THE NEW WORLD ALLELES AND THEIR POSSIBLE ROLE AS AN INTERSPECIFIC ISOLATING MECHANISM. By S. G. Stephens. The purpose of this paper is to give an account of abnormal cork production in certain *barbadense*×*marie-galante* hybrids and to consider the geographic distribution of its occurrence. The results of the investigation are summarized as follows: Interspecific hybrids between certain strains of *G. hirsutum* var. *marie-galante* and *G. barbadense* are abnormal. The abnormal types have a characteristic bushy habit owing to their shortened internodes and excess production of lateral branches. Leaves are inrolled and exhibit a yellowish mottling; and stem, petiole, and leaf midribs tend to be covered with a thick layer of cork. Such "Corky" types are more or less female sterile. Corky symptoms depend on the interaction of complementary alleles, ck^X carried by the *marie-galante* and ck^Y carried by the *barbadense* parent. True breeding Corky types cannot therefore be isolated. A geographic survey of the two species shows that the corky complementary alleles are most common in types occurring in, or originating from, areas where the geographical ranges of *marie-galante* and *barbadense* overlap, and where the two species have been grown in mixed cultivation. It is unlikely that this association is fortuitous and it is suggested that it is the result of seed selection by man in a partially outcrossed population.

THE CRINKLED DWARF ALLELOMORPH SERIES IN THE NEW WORLD COTTONS. By J. B. Hutchinson. Data are presented to show that an allelomorph series of not less than five members exists at the **Cr** locus in New World cottons. Of these, two (Cr^B and Cr^H) are normals, differing only in their heterozygotes with crinkled **cr** . Full normal (Cr^B) is carried by most strains of *Gossypium barbadense* and is rare in *G. hirsutum*, and low normal (Cr^H) is carried by most strains of *G. hirsutum* and is rare in *G. barbadense*. Crinkled dwarf (cr^D) gives rise to a leaf abnormality in which vein growth fails to keep pace with lamina development. It arises by mutation fairly frequently in various strains of Sea Island and Egyptian cotton. At least one case of reverse mutation to normal occurred in experimental material. Rugose (cr^I) and contorta (cr^C) give rise to leaf abnormalities in which lamina expansion fails to keep pace with vein growth. Contorta is responsible for a much greater degree of abnormality than rugose. Rugose arose by mutation in an Upland cotton. Only one occurrence has been reported. Contorta arises by mutation fairly frequently in the two commercial Sea Island varieties Superfine V46 and MSI. Compounds between Cr^B, Cr^H and cr^D, and those between Cr^B, Cr^H, cr^I and cr^C, exhibit varying degrees of dominance, but the heterozygotes are never superior to the better homozygote. Compounds between **cr** and cr^I or cr^C are nearer normal than either component homozygote. It is concluded that the alleles govern two separate, but interdependent, reaction systems, one concerned with vein growth and the other with lamina development. It is shown that modifying genes are not specific modifiers of the heterozygote, but act on all phases of the gene. The crinkled and rugose-contorta modifier systems are distinct. A survey of the crinkled modifier status of a range of types of *G. barbadense* and *G. hirsutum* revealed very wide differences from strain to strain. It is pointed out that this intraspecies variability in minor gene content is a regular feature of the genetic situation in the cultivated cottons, in all characters of which an adequate survey has been made. Complete dominance over crinkled is universal in West Indian cottons, and it is suggested that in this region crinkled modifiers have a value as buffers against an environmentally induced phenocopy of crinkled. The distribution of the modifiers both of crinkled and rugose-contorta is incompatible with the Fisher theory of the acquisition of dominance by selection among heterozygotes. Extending the speculations of workers on gene interaction, it is suggested that genes control the rate of reactions

that follow a sigmoid reaction curve. It is shown that the known facts of gene interaction, dominance, and differences between phenotypes in susceptibility to genetic modification can all be interpreted on such a system. Examples are also given to show that differences in gene potency arising by mutation cannot be regarded as due to genetic loss or gene inactivation, and that in related species the " wild type " may occur at any point on the reaction curve.

EVIDENCE ON CHROMOSOME HOMOLOGY AND GENE HOMOLOGY IN THE AMPHIDIPLOID NEW WORLD COTTONS. By R. A. Silow. A newly identified linkage involving anthocyanin (*R*) and a habit character (*short branch*) in the New World tetraploid cottons shows about 10 per cent. crossing-over. This linkage group is a duplicate of one previously reported by other workers, and its recognition as such gives further genetic support to the hypothesis of the amphidiploid origin of the New World cultivated cottons. It is frequently maintained that in a polyploid variability is buffered by extensive masking between duplicates, so that the evolutionary potentialities of the organism are much reduced. The fact that the amphidiploid cottons are at least as variable as the diploid species has led to an examination of the theoretical concepts underlying this situation. Although certain characters in known allopolyploids do give duplicate or triplicate factor segregation, with respect to many other characters such organisms behave as diploids. It is pointed out that identical gene duplication in the component subgenomes of an amphidiploid is likely to be the exception rather than the rule, as much on account of specific divergence which precedes hybridization as on account of evolutionary changes which follow the induction of amphidiploidy. Some examples are drawn from cotton. Anthocyanin is controlled by genes at duplicate loci of known homologous origin. The various genes affect many different aspects of the anthocyanin pattern, but, although the two loci concerned exhibit extreme multiple allelomorphism, identical duplication of genes at them does not occur. Since each gene may gain expression at one or other of the many affected locations of the plant body, complete masking is therefore not an essential concomitant of duplication in this case. Nevertheless there are no indications of any fundamental divergence between the loci concerned, either in the respective presumptive parental diploid groups of species or in the amphidiploid, but there are some indications of its early stages at the speciation level. In the case of the habit character, reduced fruiting branch, genes in the recessive phase at either of the two duplicated loci concerned can gain expression even when, as in nature, normal genes exist at the other locus. Here masking is completely absent. In cotton subsidiary considerations make it possible to recognize the two habit characters as duplicates, even though diploidization has been carried almost to completion in this case. Had divergence progressed so far that none of the alleles at the duplicate loci were any longer recognizably homologous, the demonstration of their original duplicate nature would have been impossible by ordinary means. Examples are discussed of the type of functional divergence between alelles which, when translated from the diploid to the tetraploid condition, might lead to functional divergence between the genes at duplicated loci, so that masking would not occur. Other considerations, such as the new genotypic balance accompanying polyploidy, are also discussed, and it may be concluded that there is no reason to believe that amphidiploidy adversely affects the evolutionary prospects of an organism.

180. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The seventeenth number of Series B, Physiology, will be published shortly, and will contain the following papers reprinted from the *Annals of Botany*:

STUDIES ON FOLIAR HYDRATION IN THE COTTON PLANT. VI. A GEL THEORY OF CELL WATER RELATIONS. By E. Phillis and T. G. Mason. The relative distribution of water between vacuole and cytoplasm remained unchanged when cotton leaves attached to the plant were caused to swell under the influence of salt solutions applied to the roots. The uptake of salt by leaf discs floated on salt solutions is greatly accelerated by light. Salt uptake in the dark is negligible. Water uptake in response to salt uptake appears to be independent of light, and continues for some

days after salt uptake has ceased. This persistence in water uptake has been called *carry-over*. The rate at which water is taken up in response to salt accumulation can to some extent be controlled by preliminary treatment of the disc. Discs *conditioned* by floating on water for several days took up water more slowly when transferred to salt solutions than discs placed immediately on salt solutions The amount of water finally taken up did not, however, differ significantly. Osmotically active non-electrolytes such as sugar cause no significant swelling. The relation between salt and water is linear over a considerable range. These observations *are not* in harmony with the classical osmotic theory of cell-water relations, but *are* in harmony with the view that protoplasm possesses structure and that this structure, like that of protein gels, can be weakened by salt. Some leaves accumulate salt and do not take up water—*e.g.*, citrus. In such cases it is suggested that the extensibility of the cell wall or of the protoplasmic structure or of both is unaffected by salt.

THE EFFECT OF RINGING AND OF TRANSPIRATION ON MINERAL UPTAKE. A REPLY TO CRITICISM. By T. G. Mason and E. Phillis. Criticisms by Steward of the interpretation of the results of experiments on the effects of ringing and of transpiration on mineral uptake by the cotton plant are discussed. It is shown that the main criticism of the *ringing* experiment is based on a misunderstanding of the actual experimental procedure employed. Results for another ringing experiment are presented which the authors claim support their conclusion that ringing rapidly interferes with the uptake of solutes by the roots. They also point out that Steward's criticism of their conclusion that increased transpiration caused increased uptake in ringed plants is irrelevant, for, while his criticism would be valid for normal plants, it is not applicable to plants ringed between the foliage region and the root.

STUDIES ON THE PARTITION OF THE MINERAL ELEMENTS IN THE COTTON PLANT. V. AN ADSORPTION THEORY OF NITROGEN REGULATION. By T. G. Mason and E. Phillis. Four different experiments are described in which the supply of nitrogen to the roots of cotton plants was varied. It was found that as the crystalloid nitrogen level increased, protein nitrogen also increased until it reached a maximum and then it declined markedly in one experiment. At low levels of crystalloid nitrogen the relation between protein nitrogen and crystalloid nitrogen was much the same from one experiment to another. It was suggested that in this region the protein level is predominantly controlled by the crystalloid nitrogen. At higher levels of crystalloid nitrogen the protein levels varied from one experiment to another. It was suggested that these differences in protein level were due to differences in the surface areas available for adsorption. It was also suggested that in the region of high protein the extent of the surface might vary in a single experiment as a result of changes in mineral composition. Phosphorus and potassium starvation caused a marked reduction in the protein level from what might be anticipated from the protein/crystalloid relation in nitrogen experiments. It was suggested that deficiencies of these elements might reduce the extent of the surface and so limit the protein level.

THE EFFECT OF EXTREME DESICCATION ON THE VIABILITY OF COTTON SEED. By E. Phillis and T. G. Mason. Cotton seeds stored under conditions of very high aridity do not maintain their germinating capacity as well as seeds stored at medium humidities. When seeds under such dry conditions are exposed for six months to medium humidities before testing—*i.e.*, are conditioned—they exhibit an appreciably higher percentage germination than similar seeds not conditioned. It is suggested that with very dry seeds the first stages of re-moistening must be carried out slowly if death of the seed is to be avoided. The optimum relative humidity for storing cotton seed at temperatures between 75 and 85°F. would appear to be about 30 per cent. If satisfactory processes can be devised for conditioning stored seeds before germination, it may be that storage under as dry conditions as possible would be the best.

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LOCAL COTTON HISTORY IN THE SUDAN, 1942-1946

BY

R. R. ANSON.

Chief Cotton Breeder, Anglo-Egyptian Sudan.

IN 1942 a review was made of cotton breeding work and the entire breeding policy in the Sudan underwent a complete change.

BREEDING PLOTS

At the Gezira Research Farm, Wad Medani, and the Kadugli Sub-Station in Kordofan, each of which breeds Egyptian strains and American long-staple strains, it was decided to discontinue a large number of progenies which had formerly been carried on from year to year without ever having given any clear-cut results, and to maintain only outstanding progenies. It was thought that this procedure would make it possible to devote more time to intensive analysis of the best material and in this way increase the possibilities of successful selection.

In the Egyptian breeding plots, priority would be given to the two existing commercial strains (*a*) with a view to promoting stability and uniformity of desirable characters peculiar to each strain and (*b*) improvement. In the American breeding plots the development of high lint yield of fair quality, combined with early maturity and hardiness, would be given priority.

This article is an attempt to set out, as plainly as possible, the aims and objects of the Cotton Breeding Section, giving at the same time a short description of the system by means of which it is hoped to achieve them.

EGYPTIAN TYPES

The immediate problems met with in the Gezira are: Blackarm, a bacterial disease of the stem caused by *Bacterium malvacearum*, an organism which may also attack leaves and buds; Jassid (*Empoasca*

benedettei), a leaf-sucking insect; Leafcurl, a virus transmitted by white fly, which causes the leaf to curl inwards and is capable, in severe cases, of causing complete distortion of the whole plant; and finally, to a lesser degree, Bollworm attack.

These problems have been set out above in order of their importance, but any one of them is liable, in some seasons, to cause considerable loss of crop. They are at present all being tackled by plant breeders and geneticists of the Cotton Breeding Section, who, naturally enough, have ever to bear in mind the main goal of every breeder, which is to produce a substantial increase in lint yield per acre, and keep his product up to the highest possible quality, so as to ensure that it will always be well able to compete in the world markets with cotton of similar type produced in other parts.

Blackarm.—The Senior Economic Geneticist, amongst other things, is specializing on the transference of blackarm-resistance factors. He is dependent on plant breeders at Medani for the production of pure seed stock for use as female parents. Given these, he is then able to transfer blackarm-resistant factors contained in some American and some old-world cottons. When the 7th backcross has been reached, promising material is returned to Medani for testing in progeny rows. All non-winners are culled out; the remaining strains are later tested again in the three Standard Varietal Tests situated in the northern, central and southern areas of the Gezira.

Purification and Improvement of Egyptian Cotton.—Having reached the desired degree of blackarm resistance, further improvement may be effected by passing the resistant material through the breeding plots, when further selections are made; these are then "sieved" for uniformity and improvement. This "sieving" process entails making a number of selections (200-300) of really typical plants. The produce from these 300 plants is examined separately, and tested for characters such as seed weight, lint index, ginning outturn, and lint length. Plants which come within the mean of a sample for all desirable characters are kept and grown again in progeny rows. These rows are "sieved" again, and the produce of all rows which still remain within the aforesaid mean are bulked together to form a nucleus for a new wave of pure seed for the commercial crop. Nothing but selfed seed is used. Plant progenies which fall below the mean are discarded; those which show improvement and are better than the mean for some or all desirable characters are again grown and kept under close observation. If sufficiently promising, they are eventually bulked in small plots and kept as improvements on the original strain.

Jassid-resistant Types.—The Economic Geneticist, working at Shambat and using a somewhat similar technique to that employed for the transference of blackarm resistance, is successfully transferring the

gene H (which governs leaf hairiness and is found in Tanguis cotton), to Domains Sakel, X1730 and N.T.2 types. In addition to this, some straight selections made for leaf hairiness found on X1730 types are being grown.

Leafcurl.—Selections from Domains Sakel and Massey's Selected Domains Sakel, made by the Senior Plant Breeder at Wad Medani from highly resistant plants, are being tested against "spreaders" (plants known to be highly susceptible). Highly resistant material from each of these strains has been obtained and will shortly be bulked for growing in varietal tests.

Bollworm.—At Shambat a Mexican wild cotton (*G. thurberi*) highly resistant to bollworm has been crossed with Domains Sakel (*G. barbadense*) as a first step in investigating the possibility of producing Domains Sakel highly resistant to bollworm. Seed has also been obtained from a hexaploid derived from crossing *G. armourianum* and *G. barbadense*. This too is highly resistant to bollworm, and at the same time, owing to its pungent smell, shows some resistance to jassid.

American Types

The problems met with in this field differ slightly from those met with in the Egyptian strains. The goal to be aimed at for all rain-grown cotton areas is the production of a hardy, early maturing, heavy yielding strain, giving a high outturn of good quality cotton and possessing a degree of resistance to blackarm and jassid.

Purification and Improvement of American Cotton.—Material heterogeneous for resistance to blackarm, selected at Kadugli by the Senior Plant Breeder, is sent to Shambat, where it is grown in progenies, and, by means of artificial infection, the resistant and susceptible elements are extracted. These resistant progenies are grown and tested again before the resistant material is finally bulked for distribution to a nucleus bulking area. Resistant strains thus selected are returned to Kadugli, where they are tested in standard varietal tests against the commercial variety. Much the same technique as that which has been described for Wad Medani on the previous pages is used at the Kadugli Sub-Station.

Problems such as the transference of jassid resistance to susceptible types are being dealt with at Shambat, and these types will be tested at Kadugli and Equatoria. The addition of $\mathbf{B}_3$ factor for blackarm resistance is being proceeded with on some of the American strains already known to possess $\mathbf{B}_2$, and the transference of $\mathbf{B}_2$ to some susceptible types which might prove useful in Equatoria is being continued.

Introduction of New Varieties and Improved Strains

It has been agreed that a committee comprising the Director of Agriculture, the Manager, Sudan Plantations Syndicate, the Chief of the

Research Division and the Chief Cotton Breeder should, when the occasion arises, meet to decide whether or not a new variety or improved strain should be recommended as a replacement of the present commercial strain or strains, and bulked to commercial proportions.

The committee's recommendations should be made to the Gezira Advisory Board and at a later date to the Board of Management, through the Cotton Research Committee. A chart showing results of both spinning tests and varietal tests for three consecutive years is to be made available to the committee. The attached plan gives an example of the method of bulking which would be adopted should the Board of Management decide to replace the present commercial crop by a strain or selection considered to be an improvement.

Propagation of Egyptian Cotton

The vital importance of maintaining purity of high quality cotton should ever be borne in mind by the cotton breeder; and however careful he may be with his material in the laboratories and in his breeding plots the outcome of his work stands a chance of being severely affected if the system of propagating his nucleus areas is faulty. It is for this reason that the Cotton Breeding Section has applied for a special appointment to be made to fill the post of Plant Propagation Inspector, whose duty it will be to follow new strains through their various stages of expansion until they ultimately reach commercial proportions.

The S.P.S. Seed Farm at Barakat will probably be confined to the growing of Domains Sakel types, and as new improvements are brought to light they will, in the first instance, be grown in small bulks at Barakat, then on an isolated area in the Gash Delta. The system will, however, of necessity have to be elastic, in order to cope with seasonal vicissitudes and varying yields, etc. The general system of bulking to be adopted follows roughly these lines:

i. In the first season, seed from bulked families, thoroughly tested for purity of type and sufficient for at least 1 acre, is planted on an area isolated from other cotton.

ii. In the following season a 10-acre plot is planted up from this nucleus at Barakat on an area well isolated from other cotton, and a 20-acre plot planted with seed from the same source is grown in isolation in the Gash.

iii. 250 acres, or as much as can be sown with the seed from the 10 acres, are grown at Barakat and skirted by an additional area of 250 acres sown with seed from the 20 acres grown in the Gash in the previous season. This is done to prevent the possible spread of blackarm from primary infection. (Past experience has been that Gash-grown seed does not suffer to any extent from primary infection, whereas Gezira-grown seed does.)

iv. Seed from the centre of the 250 acres is then sent to the Gash for bulking up on an area well isolated from other cotton types. Every attention will be given to the ginning of this crop, in order to ensure that there is no possibility of mixing or contamination.

v. The first wave of newly selected Domains Sakel is brought back for growing in the Gezira.

The X1730 types are to be tested in a similar manner, and the Hamid el Nil block will most probably be set aside for work on these strains when they become ready for bulking.

Propagation of American Cotton

A somewhat similar system to that described above is used for the bulking of nuclei from American cottons, the difference being that agricultural farms at Kadugli and Talodi are used for isolating the first seed increase areas. The seed is then taken through the Abu Habl Irrigation Scheme, situated at Rahad, some 50 miles north of El Obeid, where it is bulked under irrigation on areas ranging from 500 to 1,000 acres. These, under normal conditions, should supply sufficient seed to be grown on one of the several factory areas which, owing to the difficulty of obtaining transport, had to close down during the war.

In this way there should be no danger of any cross-pollination taking place between one strain and another, especially as the present policy is to grow only one strain of cotton throughout the whole of the American rain-grown cotton areas.

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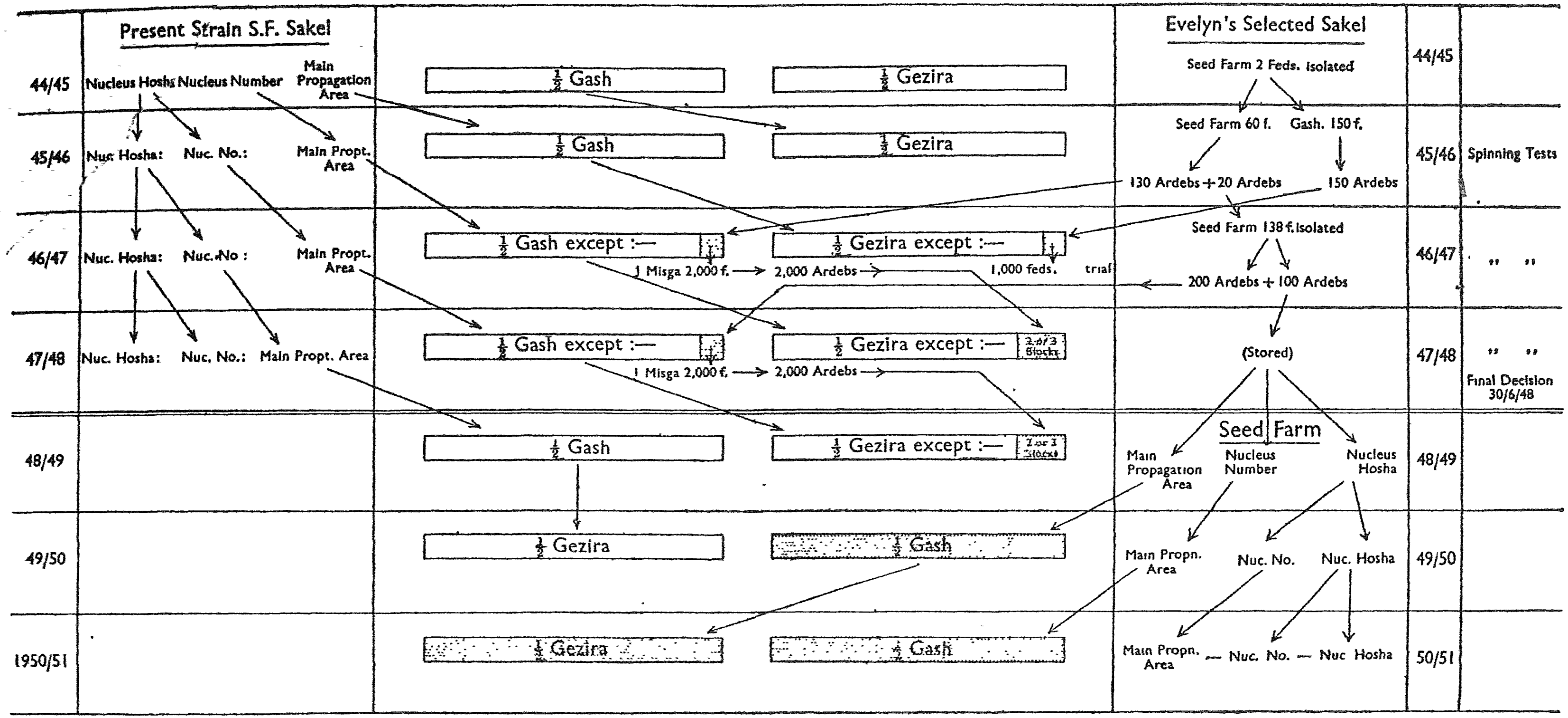
Alternative Plan for Change-over of Sakel Seed



A TEXTILE TECHNOLOGIST IN THE COTTON FIELD—I

BY

E. LORD.

Shirley Institute, Manchester.

FOR many years the Shirley Institute has worked in co-operation with the cotton breeders of the Empire Cotton Growing Corporation and with the agricultural officers engaged on cotton problems for the Departments of Agriculture in the various Empire countries. When these workers return to England, at infrequent intervals, many take the opportunity of visiting the Shirley Institute to discuss various aspects of their own particular problems and to keep in touch with technological research, especially that relating to raw cotton. For a long time it has been evident that it would be desirable for a member of the Institute staff to reverse this process, to visit a number of cotton-growing areas and obtain first-hand information on the practical side of cotton growing and the current methods of cotton breeding. For the fullest value to be obtained from research on raw cotton, both plant breeder and technical research worker must move along common lines. This is only possible when each understands the aims and objects of the other and has some knowledge of the methods employed, and difficulties encountered, in the different fields of enquiry.

Following invitations received at the Institute from the Directors of Agriculture of the Anglo-Egyptian Sudan and Uganda, the Empire Cotton Growing Corporation made arrangements whereby the author of this article recently made a tour of some of the more important cotton-growing areas in these countries. Some of the many points of personal interest observed on this tour are outlined below.

Reports of many kinds are often expected following a visit made for a specific purpose, but readers will certainly not need to be presented with a straightforward account of all the cotton research in progress in the Sudan and Uganda. A far more authoritative review may be gained by reference to the current copy of the "Progress Reports from Experiment Stations" published by the Corporation. The present article is written in a more light-hearted vein and purports to give only a few naive impressions of an innocent textile technologist suddenly transported for the first time from the late October cold and rain of Manchester to the depths of hottest Africa.

Khartoum was the first stage of the tour, and, when I stepped from the plane into a temperature of about 110° in the shade, I was greeted

by the Economic Geneticist from Shambat, who cheerfully remarked how fortunate I was to have my arrival coinciding with the beginning of the cold season. He promised to see that I became slowly acclimatized to the unfamiliar Sudan conditions. The nature of this slow process soon made itself apparent—up next morning before daybreak and off before breakfast with a party to hunt wild cottons in the neighbourhood of Omdurman. As a delicate newcomer to the Sudan I was provided with a large flask of cold water for my later refreshment in the heat of the day. The flask was nursed most tenderly as our lorry bounced its way across the stony desert to the rocky hills, or jebels. Then followed a long scramble and, at last, we found growing a plant of the type we were seeking, an uncommon wild species previously discovered there some time ago. But what made this trip a great success was the discovery of another plant, of a second species hitherto not known in that part of Africa. The Economic Geneticist, with the foremost geneticist of the Corporation working on the more fundamental side of the subject and therefore presumably an "Uneconomic Geneticist," and others from the Department of Agriculture all gathered around this poor scruffy plant, learnedly conjecturing how it fitted in with the general theory of the development and spread of cotton species throughout the world. Meanwhile all I could do was to work out its commercial value based on an estimated lint yield of about 1 lb. per acre worth no pence per lb., perspire profusely and watch my carefully preserved and untouched supply of water brought along and poured around the plant prior to lifting it for transport back to a happier home at Shambat. At last the party moved off, slowly at first, as if reluctant to leave the field of success, but soon at a far more rapid pace after a member of the Sudan Defence Force came dashing up to inform us that the nearby large rock had been chosen as the artillery target for practice that morning.

After several days at Shambat, much of the time spent listening to the vivid, lengthy arguments of the Economic and "Uneconomic" Geneticists, I began to sort out the welter of long, imposing terms and realize more closely the scope for the application of fundamental genetics to cotton breeding. Among the topics of greatest interest to me was the subject of blackarm resistance. The synthesis of blackarm-resistant strains by the use of a well-controlled back-crossing technique is of great importance, not only in the Sudan but in all areas where blackarm disease takes a heavy toll of the cotton crop. The effective segregation of Shambat from the main Sudan cotton areas renders it an ideal place for carrying out this type of work, and diseases may be introduced among field plants without danger of their spreading to the commercial crop. Another and more recent development which will steadily assume increasing importance is the formation of interspecific hybrids, and the subsequent use of these new synthetic species of cotton for transferring

one or more desirable characters from an otherwise " useless " type of plant to a commercially valuable cotton. Among the various projects depending upon this work was one which aroused especial interest, viz., the possibility of obtaining a Sakel or American type of cotton having resistance to pink bollworm by transference of this character from either *G. thurberi* or *G. armourianum*. The case of *G. armourianum* is particularly outstanding; this wild cotton appears to derive its resistance to pink bollworm from the copious supply of a strong-smelling essential oil found in the oil glands dotted over the plant, especially in those on the surface of the boll.

Another outstanding programme is that designed to obtain a Sakel strain of cotton with marked resistance, or virtual immunity, to jassid attack by transference of several genetic hairiness factors from cottons of such varied species as *G. barbadense, hirsutum, anomalum, arboreum* and *tomentosum*.

Shambat gave me an initial and varied insight into many of the methods and practices of the Sudan; amongst which might be mentioned the efforts of eight or ten men, labouring unsuccessfully for over an hour in one of the main thoroughfares of Khartoum, endeavouring to fold up the stiff neck and legs of a dead camel and force the body into the municipal refuse cart.

The first main cotton area to be visited was the Nuba Mountains in the Kordofan Province, where most of the Sudan-American crop is grown under rainfall conditions. This area is composed of groups of granitic jebels, which rise up sharply from a more or less level plain. The lower slopes of the jebels were formerly cultivated on a large scale by the Nubas, who constructed low terraces following the contours of the steep hillsides to avoid soil erosion. Many of these terraces remain, and some are still used for the raising of early grain crops. The people live mainly on the lower slopes or in the encompassed valleys. Here water is most plentiful and pools or shallow pits or wells provide a supply throughout the year. Now that the danger of Arab raiding parties is past, much of the agriculture has moved out on to the flatter lands, especially to the browner and moderately heavy clayish tracts of cotton soil. The people still generally live in their old villages among the jebels and frequently travel long distances to cultivate their crops. Still further away from the jebels the heavier and greyer clays are often suitable for crops, but the lack of permanent water supplies at present would prevent the harvesting of any crops sown in most of these places. The annual rainfall in the Nuba Mountains varies from about 24 inches in the north to about 32 inches in the south. It is the, as yet, inadequate use of water, rather than lack of it, which causes many fertile districts to be virtually unpopulated. The construction of permanent shallow wells near the jebels, deeper wells on the plains, and the use of the flood

waters of some of the seasonal rivers, would enable a larger population to live here in a greater degree of comfort. The Abu Habl Scheme, started in 1945 near Rahad, already provides a demonstration of the marked benefits which follow the development of flood irrigation.

The Uneconomic Geneticist and I were fortunate to have the Chief Cotton Breeder take us on tour of the Nuba Mountains. We made our centre at Kadugli, the cotton experiment station for this area, and the first week was spent in the neighbouring districts. When Friday came, the Chief Cotton Breeder decided that we should follow the local custom and have a " day of rest." After an early breakfast we set off towards Lake Keilak on a duck-shooting expedition. Some distance from the lake we were held up by a marshy khor, about a couple of hundred yards wide. The local guide informed us that it was quite easy to cross, so we prepared to wade. Just before entering the water, however, one of us fortunately asked how deep it was. Getting the reply that the water never came higher than the armpits, we sent him over to arrange for some form of transport. After a long wait the transport arrived—one horse and one bull. Being of a naturally polite disposition I insisted on the other two venturing first. After seeing the horse twice endeavour to sit on top of the Uneconomic Geneticist in the deepest and muddiest part, I signalled for the bull to be sent back as the safer form of transport. The " day of rest " continued. A gentle stroll of four or five miles through the sand, with the sun pouring down, brought us to that stretch of mud, weed and water known as Lake Keilak. The limited supply of cartridges was expended, the bag of duck was obtained—two little specimens. Halfway back to the muddy crossing we were met by the local sheikh. Soon the Chief Cotton Breeder bestrode a donkey, with his knees well up to keep his feet off the ground, whilst the Uneconomic Geneticist and myself were each on an Arab steed. These two horses appeared to be badly educated, and after struggling to guide them we were forced to let them follow the lead of the donkey. If only someone had explained beforehand that Arab horses have a left-hand drive, we should have got on far more rapidly—apparently we were the uneducated ! The sheikh insisted on our stopping at his hut and provided us with lemonade, served European style in one glass tumbler, one china mug, and one large pudding basin. I was given the basin, and, recollecting the customs of Arab hospitality, I eventually made the two pints of lemonade disappear. But the glasses of hot, sweet tea which followed were a very great strain on my politeness. To cut the story short we successfully negotiated the marshy river, after competing for the bull, and reached Kadugli in time for lunch—served at 9 p.m. Both the Uneconomic Geneticist and I were sincerely thankful that the next day was one of work, not of rest.

Cultivation in the Nuba Mountains is primitive; the soil is loosened

with a hoe or flattened pole before sowing and later the plants are thinned, and weeding carried out as the cultivator thinks necessary. Following the introduction of cotton into this area, the land was usually cleaned by firing the grass, and crops were raised for several seasons until the soil became exhausted. The ground was then allowed to revert to bush and the cultivator moved on to another patch. A different practice, known as "harig cultivation," has developed in the past few years and is rapidly spreading to become a general feature. The tall harig grasses grow abundantly on the fertile plains of cotton soil. Following the onset of the rains the new grass and weeds immediately begin to shoot up. Shortly afterwards the old dry grass of the previous season is set alight; this dense mat of vegetation burns fiercely and so destroys the new growth and weeds. The land is then roughly prepared, sown, and germination of the seed takes place after the arrival of the second rains. Two successive crops of cotton, or of dura, are usually grown and then the land is allowed to revert to harig grasses for two years or so, according to the local prevalent practice, which is not yet firmly fixed. Harig cultivation has the marked advantage of avoiding excessive soil erosion, the cleaning of the crop is easier because most of the weeds are killed by the burning, whilst many insect pests are reduced. It has, however, the disadvantage of shortening the effective season, and earliness of growth is now an essential requirement in any cotton developed for cultivation in the Nuba Mountains. Until recently the old Pump Scheme strain of American cotton was the most suitable for commercial production, but it appears likely that either SP 84 (*Rest*) or possibly NT 205/43 will become the type for the future. Both of these cottons are of earlier habit and therefore of better yield than Pump Scheme strain, and both possess the additional advantage of containing the $\mathbf{B}_2$ factor for blackarm resistance (the inclusion of this one gene appears to give sufficient resistance to blackarm attack of the intensity experienced in the Nuba Mountains).

Before passing on, mention might be made of a now rare fertility dance which we saw in one of the Nuba villages. After all, it would not pay to have overlooked this essential agricultural practice needed to produce a good crop in the next season. The present of six "chickens" and a whole sheep, with which we came away from the dance, was put to good use. It might be added at this point that those whom I met in the Sudan would like to know why I cast a baleful influence over all forms of motor transport. This Jonah property started in Kordofan with a burned-out magneto of one lorry, a shattered chassis of a second and a front wheel which merrily bowled away from a broken front axle, not to mention several long trips which had to be made with complete absence of brakes. This influence steadily grew, and temporarily put out of action five cars in the last three days of my stay in the Sudan.

The largest Sakel area is the Gezira, and this was visited on several occasions in order to see the crop in various stages of its development. The bulk of the crop is raised under the control of the Sudan Plantations Syndicate and on a much smaller concession of the Kassala Cotton Company. There are two now well-known types of Sakel; the Domains strain originating from seed imported from Egypt is grown mainly in the north, and the leafcurl resistant X1730A selection from Sakel stock is grown in the south. The Sakel Domains type appears on the market as " S " cotton, and the coarser and somewhat shorter X1730A type is sold under the " L " series of grades. The Government White Nile Alternative Livelihood Schemes mainly grow " S " cotton, and the Abdel Magid area has substantial areas of both types. Away from the Gezira Perennial Irrigation Scheme are two flood-irrigation areas in the east and north-east, both under Government control. The Gash region grows both " S " and " L " cotton and serves as a blackarm filter, receiving its seed from the Barakat Seed Farm in the Gezira and returning the multiplied seed to the Gezira for the main crop in the following season. The Tokar area grows only the " L " type of cotton, from seed originating from the Gash area.

I must confess I saw little of the art of plant breeding whilst staying at the Gezira Research Farm, Wad Medani, but I certainly saw plenty of the science of controlled breeding. One large problem receiving attention there is the improvement in the purity and uniformity of the two main Sakel types, without resorting to close in-breeding which might prove detrimental to yield. The Senior Cotton Breeder at Medani selects a large number of typical plants. For each of the two types the produce of each plant is submitted to laboratory examination, determining characters such as lint length, feel, G.O.T., seed and lint weight, number of bolls per plant, etc. The seeds from plants with mean values of the various characteristics falling within a narrow range on either side of the grand mean are grown as purity selections in numbered progeny rows. In the following season each plant in each row is submitted to the same battery of tests, and all rows in which any of the plants show distinct variation from the general character are scrapped. The remaining rows, with desirable and similar characters, are bulked to form a small nucleus stock of uniform material. The expansion of this nucleus is carried out in co-operation with the Barakat Seed Farm of the Sudan Plantations Syndicate, and tests are also made at the Shirley Institute over a number of seasons to ensure that the fibre and spinning characteristics do not differ from the bulk. Running parallel with this " sieving " programme is the development of " Improved Selections," which makes use of material having desirable characters superior to the general mean but which were discarded from the "Purity Selections." T hi atter work is carried out, not for an immediate purpose, but to have a

hand a strain which could replace the present type should there ever arise a demand for a markedly superior style of cotton.

Lack of space prevents discoursing on the selection of earlier types to obtain improvement in grade and other economic factors, the large amount of work being carried out on agronomy, the campaign against locusts, jassids and other insect pests, and the many other varied projects in the Sudan. One thing which cannot be omitted, however, is mention of the invigorating atmosphere of concerted effort prevalent in the Sudan. The Research Division, the field staff of the Department of Agriculture and the Sudan Plantations Syndicate provide an excellent example of highly organized, good team-work; the closeness of their co-operation is only rivalled by the breadth of their mutual constructive criticism, based on sound experience and offered in a most helpful spirit.

The second part of this article will be devoted mainly to the Uganda part of the tour. Mention will, however, be made of the Equatoria region, which in many ways, geographically and ethnologically, is linked more closely to Uganda or the Belgian Congo than to the central and northern parts of the Sudan.

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INSECTICIDES AND THEIR APPLICATION, 1939-1945

BY

DR. A. B. PAGE.

Imperial College of Science and Technology.

THE story of insecticide development during the war years is well worth considering. It begins with neglect or misappraisal, continues with a concentration of effort in all fields—scientific, administrative and technical—and ends with the considerable measure of success that such concentration always brings.

The main application was, of course, to the protection of the armed forces from insect-borne and mite-borne diseases, and its results open up the possibility of a new level of health for those who live in the tropics which may have far-reaching consequences. Considerable advances have also been made in the protection of animals, growing crops and stored food, and these advances, if we develop them, will contribute similarly to a higher level of agriculture, horticulture, and storage of food. The most pressing need is to make widespread use of known methods and materials in order to save life and avert famine, although many problems still remain unsolved and demand a proper provision for fundamental and applied research commensurate with the benefits it will bring.

In 1939 the three most important contact insecticides for general use were pyrethrum, used mainly against flies, mosquitoes and bed-bugs and against certain pests of stored food, and nicotine and rotenone, used mainly against pests of growing crops. For the special purposes of dealing with resting stages of pests on dormant trees and orchards the tar-oil and petroleum washes are, of course, in a class by themselves.

There were as well several synthetic insecticides which were cheaper and were used chiefly for part-replacement of pyrethrum to reduce cost.

The first effect of war was a demand for large quantities of rotenone as a component of anti-louse powder, the louse being the insect of greatest medical importance in the war of 1914-1918. Next, after Italian successes in Africa, which threatened our communications, the cultivation of pyrethrum in Kenya was made secondary to the growing of wheat. The effect of this reduction of pyrethrum was made more serious by the cessation of supply from Japan and the simultaneous demand for the control of mosquitoes in the malarial jungles of Burma and afterwards in the East Indies and the Pacific Islands. For a time, too, a high proportion of the available supply was taken by America for domestic purposes and later was used lavishly by their armed forces,

so that very little remained to protect the troops of Britain, the Dominions and the Colonies.

This bad position soon began to improve. An agreement was made which resulted in a great increase in the acreage of pyrethrum in Kenya. Some of this acreage was not at an optimum altitude and so returned a low yield, but the total output was much increased. There were also increases in acreage in other parts, notably the Belgian Congo and Brazil. It was further agreed that pyrethrum should be used not at all either in Britain or America for domestic purposes and used only to a very limited extent in agriculture, horticulture and the control of insects in stored food. Substantially the whole of the pyrethrum produced was thus made available for the protection of the armed forces, and by a further agreement this was divided between Britain and America in the proportion of the number of men exposed to risk.

There was of course a considerable period between extension of the acreage and actual production of pyrethrum extract, and during this period much attention was given to means of making a given weight of pyrethrum kill more insects. The addition of certain substances to spray liquids containing pyrethrum was alleged to render them more highly insecticidal, and such substances were called "adjuvants," "synergists" or "activators." Their mode of action is still imperfectly understood. Some were insecticidal, but many were completely inert in themselves, at least in the concentrations used. Two were extensively used in war-time sprays, heavy mineral oil and sesame oil in American specifications, and sesame oil in British.

It is now clear that heavy oil acts by preventing the spray droplets becoming so small as to prevent their being picked up by the flying insects. Light oils, such as kerosene, evaporate fairly quickly from the droplets of a spray, but the heavy-oil component remains. Too coarse an atomization also results in waste, the large droplets falling to the ground before the insects make contact with them. Spray is picked up on the wings of insects in flight and on hairs and scales, and the optimum droplet size is somewhat different for each species, varying with the hairiness, scaliness and the wing beat. Thus, under some conditions, with the usual spray liquids, certain types of atomizer produce too fine a spray and the addition of heavy oil is an advantage. Certain spray liquids developed in America during the war consisted originally of the necessary amount of pyrethrum concentrate dissolved in a liquid—"Freon"—which boils well below atmospheric temperatures and so evaporates at once from the droplets directly these are formed. Most of the droplets thus produced were too small and the addition of heavy oil remedied this.

The mists produced in this way are called aerosols. The small size of their droplets permits the release of very small quantities of liquid,

which is charged with a correspondingly high percentage of pyrethrum. Thus enough pyrethrum to kill mosquitoes in 225,000 cubic feet of space can be contained in 18 oz. of insecticide. Further, since the pressure needed is supplied by the vapour pressure of the freon no apparatus is required, the aerosol being formed from a spray produced by allowing the freon to escape through a fine orifice, opened or closed by a needle valve. Small units of this type—aerosol "bombs"—were of great military value. They were easily carried, did not betray the presence of troops, and could be used for protection in areas which had to be approached secretly.

The British equivalent was an even smaller unit. It consisted of an ordinary " sparklet " carbon dioxide bulb such as is sold for making " soda-water " at home. Freon was not available in England, so the expulsive effect was provided by a small charge of carbon dioxide and the pyrethrum was dissolved in a mixture of kerosene, acetone, and an aromatic solvent, and a small amount of sesame oil was added as activator. The sparklet bulb was modified by the addition of a dip tube, the effective bore of which was greatly reduced by a baffle wire, and closed by a soft copper end. When this end was broken off and the sparklet bulb held upright the insecticide was ejected as moderately fine spray which carried several yards and the droplets of which became rapidly smaller by evaporation of the acetone and some of the kerosene. Each bulb disinfested 1,000 cubic feet of space and six or more could easily be carried in the pocket. They contained no mechanism and were thrown away after use.

Sesame oil can be advantageous in two ways: firstly, in preventing the droplets becoming too small, and secondly, in rendering the pyrethrum more insecticidal. This second action is produced by the compound called sesamin, which is always contained in good samples of the natural oil. A very small amount of sesamin is required, no more in fact than the amount of pyrethrins, the active principles of pyrethrum.

In investigating the effect of adding sesame oil to a pyrethrum spray liquid results will depend on: the test insect, the atomizer, the temperature, the duration of exposure, the space for flight, the concentration of pyrethrum, the dosage, the content of sesamin and proportion of sesame oil. It will be appreciated that these results often appear contradictory.

Other compounds act in the same way as sesamin. One of the earlier and better established goes by the cumbersome name of isobutylundecylenamide, I.N.-930 for short. Piperonyl compounds are said to act similarly, as well as being insecticidal themselves.

With the same ultimate object, the economizing of pyrethrum, new formulations of spray liquids were tried, in the expectation that they would increase the proportion of pyrethrins actually affecting the

insect. The insect has a highly protective skin. This skin is a complex organ with an outermost waxy layer, not easily wetted or dissolved by many liquids. It was thought that the inclusion of certain solvents or wetting agents in sprays might lead to a great increase in the penetration of the pyrethrins through the skin and reduce the amount which had to be picked up by the insect to kill it. Another type of formulation was based on the property of the pyrethrins of concentration at an oil-water surface. In a solution in oil, kerosene for example, the concentration of pyrethrins is no greater at a surface than in the bulk of the liquid, but in an emulsion of oil and water the pyrethrins are largely concentrated at the very extensive oil-water interface. It was thought that more of a given weight of pyrethrins picked up by an insect would be available from this surface, where it was concentrated, than from an oil solution where it was uniformly dispersed.

Emulsions prepared during the war years did not lead to the saving of pyrethrins that was expected, but there is little doubt that successful applications of these underlying principles will eventually be made. The writer believes that more rapid progress will result from a method of investigating sprays which has recently been developed and in which the average weight of spray, or active principle picked up per insect, is actually measured.

A class of substance which is allied to the insecticides and which rendered good service in the war is that of insect and mite repellents. Essential oils, particularly oil of citronella, have long been applied to exposed surfaces of the body to repel mosquitoes, but they are not sufficiently effective to prevent spread of malaria. Pyrethrum, in a suitable medium, will give some protection. It is, of course, a powerful nerve stimulant, which acts more quickly than any other insecticide, and directly a mosquito makes contact with the skin which is covered with a preparation of pyrethrum it flies off at once without actually settling. Some people become sensitive to pyrethrum on the skin and develop dermatitis, and this defect, coupled with the need to conserve supplies for use as an insecticidal spray, led to the search for other repellents. Those so far discovered have all been high-boiling liquids and, for the most part, have been used as such by direct application to the skin, although there are some advantages in making them into pastes or creams containing inert powders such as those which are used in cosmetics.

The principal mosquito repellent used today is dimethyl phthallate. It is not effective against all types of malaria-carrying mosquitoes, and to overcome this defect the American forces used it mixed with two other repellents known as "Indalone" and "Rutgers 612." Dimethyl phthallate is also repellent to mites as well as being toxic to them, and was used by the American forces to protect from scrub typhus, which is carried by thrombiculid mites. Australian investigators found dibutyl

phthallate was considerably more effective and this was used by their forces. Both substances are applied to socks, trouser bottoms, etc., or used to impregnate cloth from which clothing is made.

In 1936-37, J. R. Geigy, A.G., of Basle, Switzerland, discovered that a synthetic compound 2′2-pp′-dichlordiphenyl-1 : 1 : 1 trichloroethane, now known as D.D.T., possessed insecticidal properties. Its use was not developed at that time and it was not until 1942 that it was patented in Britain and 1943 in the U.S.A. A great deal of experimental work both British and American has since been carried out with this compound and it has been shown to be a highly important insecticide. It is a white crystalline compound without appreciable odour. Commercial samples vary in purity from 60 to 100 per cent. and may be somewhat waxy. The impurities have little insecticidal value. It is practically insoluble in water, but dissolves with some difficulty in kerosene to form a 5 per cent. solution. Cyclohexanone is a good solvent and was largely used in American preparations, but is very expensive. Very good solvents and much cheaper are a class of compounds called alkylated naphthalenes. Some of these are sold in America under the trade name of "Velsicol."

Various types of emulsion can be made, as well as dusts and dispersible powders, which contain different percentages of D.D.T.—from 10 to 80 on various inert minerals (kaolin, talc, pyrophyllite, silica, alumina, etc.).

The outstanding advantage of D.D.T. over vegetable insecticides, particularly pyrethrum, is its chemical and physical stability. Its main disadvantages are its slow action and its liability to produce toxic effects in fish, in birds, and in man and other mammals.

If D.D.T. is deposited on a wall, ceiling, etc., insects which alight repeatedly on the treated surface and crawl over it pick up a lethal dose. Owing to the stability of D.D.T. the surface remains insecticidal for a long period, the exact length depending mainly on the amount and concentration of the preparation used per square foot, the nature of the surface and its degree of exposure to wind, rain or sun. In general, indoor surfaces which have received a sufficient dose continue to kill insects for a period of several months, whilst outdoors the coating on leaves, etc., becomes ineffective in a few weeks. D.D.T. can be deposited on surfaces as a powder, a smoke, a suspension, an emulsion or a solution, and can even form the active ingredient of insecticidal distempers and paints.

Not all preparations are equally effective. Solutions of some specimens of unpurified D.D.T. sprayed on to smooth surfaces often form a smooth skin which is initially not very active but becomes more so as crystallization is induced by scratching or brushing or even by insects alighting on and walking over this skin. Fine mists and smokes are deposited, eventually, on horizontal surfaces such as

floors, table tops, etc.; they do not readily stick to vertical surfaces such as windows and walls, particularly if these surfaces are smooth. If, as in rooms, stores, factories, etc., it is desirable that these surfaces should receive a toxic deposit, they should be coated directly by a spray which is fine enough to be spread evenly but coarse enough to stick.

The mechanism of the reduction of toxicity of a surface coated with D.D.T. with time has not been fully investigated. There is always an initial loss of D.D.T. within all materials that are in the least absorbent. On certain leaves, for example, this may account for half the insecticide applied. Out of doors, wind and rain and the growth of vegetation must be powerful agencies in subsequent loss, and sunlight may have some effect on D.D.T. deposited on leaves, even though it is without effect on D.D.T. on an inert surface. Indoors, some of the deposit must be rubbed off in course of time and the rest must become partly covered with dust, which may prevent proper contact with it. Particularly if the surfaces are ventilated and heated, either artificially or by the sun, some appreciable loss by volatilization must eventually ensue. An obvious way to avoid some of these losses is to incorporate the insecticide in a paint or distemper. Ships' bottoms have been kept clear of barnacles in this way, but so far the paints have not been very successful and the oil-bound distempers have been only slightly better. It seems that though one succeeds with such preparations in sticking the insecticide to the wall one often covers it with a film of oil or other material which serves to protect the insect.

This mode of using a contact insecticide is not new. Some ten years before the war a similar technique had been developed in England, employing pyrethrum in a heavy, colourless and odourless mineral oil. Such a preparation, containing about 1·5 per cent. pyrethrins, will give excellent kills of moths and moth larvæ and a useful control of many other species of stored-product insects over periods of a month or thereabouts. As with D.D.T. the effect varies with the nature of the surface. Unlike D.D.T. the pyrethrins become oxidized in air. Whilst they remain in solution in oil they are protected by anti-oxidants added for this purpose. If for any reason, such as selective absorption or the use of too volatile an oil, they are left without oil or at least with only a minute film, they will cease to be protected and will lose their insecticidal properties.

It is outdoors in sunlight that deposits of D.D.T. are so superior to films containing pyrethrum. The relative stability of such deposits was of the highest importance in protecting troops from malaria-carrying mosquitoes. For example, a widespread preliminary spraying from aeroplanes would kill large numbers of mosquitoes for a period of several days, during which landings could be made and beachheads established in infested areas without any heavy outbreak of malaria.

The stability of D.D.T. also allowed of its use in oil or in the form of an emulsion spreading over the surface of water, as a mosquito larvicide. Transport is one of the big problems in controlling pests over wide areas and this is especially true in war. Any saving in the amount of material for insecticidal work was valuable during the war, and a big saving in the transport of oil was effected by dissolving D.D.T. in the plain oils which had previously been used as larvicides. The use of emulsions would have effected a still greater saving, and these were being developed towards the end of the war. The emulsion concentrate can contain up to 20 per cent. D.D.T. and is diluted with water at the scene of operations to give a suitably dilute material for spraying. The spray droplets spread out over the surface of water to form a film of minute oil droplets, each of which contains the correct amount of D.D.T. to give the proper dosage per acre. It is necessary to compound the emulsion so that it has a sufficient initial spreading pressure to spread over dirty water. Other types of emulsion are also useful under certain circumstances. If the breeding water is shallow an emulsion which spreads throughout the whole depth of the water may be preferable and, in the presence of certain weeds which obstruct surface spreading, it may be better to use another type which spreads, mainly, just beneath the surface.

The greatest saving of all, in transport, will probably be effected by the use of dispersible powders, assuming that water will generally be available or that it can be fetched from a short distance. If suitably light and finely divided minerals, such as a very fine silica, are chosen for the inert base, preparations can be made which contain up to 80 per cent. D.D.T. and which disperse well in water, extremely little agitation being required to keep the dispersion uniform. These fine dispersions can be sprayed through an ordinary nozzle just like a solution. Besides the saving in transport there is probably less wear on dispensing equipment with these aqueous dispersions than with dry powders and less wastage by drifting in the wind, but every type of preparation may well have its proper place.

The outstanding success of D.D.T. dusts during the war was their use in the control of lice. The method of application consisted in puffing a small quantity under the clothing and next to the skin near the parts liable to be affected. This could be done so quickly and simply that vast numbers of people could be treated and epidemics of typhus brought under control, which probably could not have been done in any other way.

The extremely high degree of freedom from lice of the armed forces of Britain, the Dominions and Colonies and America was due to a large extent to their wearing shirts which had been impregnated with D.D.T. by being dipped in a solution in white spirit or other volatile solvent. The impregnation remained effective after eight launderings. The

shirts could be re-impregnated in field laundries by using a suitable D.D.T. emulsion.

The toxicity of D.D.T. to fish and birds and to man and other mammals has already been mentioned. Before adopting D.D.T. for any particular purpose during the war sufficient toxicological data were obtained to enable some assessment of risk to be made and instructions for safe handling to be issued. The taking of some risk was fully justified by the excellent results obtained. Further work has suggested the advisability of proceeding with caution in extending the use of D.D.T. in peacetime.

Looking at the subject, first of all, in a broad practical way it is obvious that normal handling produces no acute effects in man and, even over a period, no obvious effects of any kind. This is certainly not proof that no harm is being done, since symptoms are often absent in the earlier stages of chronic poisoning. The need for caution is shown by three types of observation.

First the specific nature of the action. For example, rabbits have been found to be ten times as susceptible as rats to poisoning by application of a solution in kerosene to the skin and six times as susceptible to subcutaneous injection of a solution in medicinal paraffin. Smaller differences have been found on ingestion. Experiments with certain animals suggest that the safe limit for ingestion may be quite high, perhaps 1¼ oz. of a 20 per cent. dust or ¼ pint of a 5 per cent. solution for a man weighing 11 stone. In fact, the solvent might be more toxic than the insecticide! Not much importance should be attached to these figures.

Secondly, small animals have been killed or injured during practical applications. In general it is true that these happenings are mostly due to carelessness—*e.g.*, farm cats and dogs have actually been sprayed with a 5 per cent. kerosene solution, presumably to rid them of vermin—but other results, such as unexpected killing of rats, are not easy to explain.

Thirdly, it has been found that D.D.T. accumulates in certain of the fats; in particular, notable amounts are found in the cream of the milk of both cows and goats which have received a small dose daily over a considerable period.

D.D.T. can enter the body through the skin, the mouth and stomach and the lungs. Aqueous preparations do not readily penetrate the skin. Indeed, the aqueous suspension would appear to be the safest preparation to handle, once the powder has been wetted. While D.D.T. is being handled dry some care should be taken to avoid breathing it or getting any in the eyes. Oil solutions and oil-water emulsions should be handled with greater care. If the hands are likely to become freely wetted they should be protected with suitable gloves. Thorough

washing immediately after spraying is essential. The eyes, nose and mouth should be protected against D.D.T. suspended in the air, whether as mist, smoke or dust.

Although D.D.T. has given promising control of insects attacking many food and fodder crops experimentally, it cannot yet be recommended for use on a large scale owing to the amount which would eventually be eaten with the food. This embargo applies also to the treatment of harvested food, but not to the treatment of bins in which, for example, grain is stored, or to the treatment of bags or other containers; indeed, such treatment often provides excellent protection, even against insects which are very difficult to exclude, such as the cadelle.

The importance of the toxicity of D.D.T. to fish and birds, and indeed to beneficial insects as well, lies chiefly in its stability and the widespread manner in which it may be used. Fish are very susceptible, and field observations show that they may suffer considerably in normal practice, whilst birds are not seriously affected.

The local effect on beneficial insects, bees and other pollinators and predators of harmful insects can be quite serious, but it seems unlikely that, except perhaps in forest areas, application will be so widespread as to produce more than temporary effects. Owing to its effect on predators and to its failure to kill certain pests its successful use may require careful planning and sometimes the help of auxiliary insecticides where there is a complex insect association. For instance, in apple orchards it can give very good control of codling moth but, by itself, leads to serious increase of mites (red spiders). This can be avoided by combining with it nicotine-bentonite-oil.

This raises the question of the compatibility of fungicides and other insecticides with D.D.T. Pyrethrum and rotenone as well as the fluorides and calcium and lead arsenates are compatible. Nicotine produces decomposition under some laboratory conditions but not necessarily under practical conditions. Lime sulphur has no action and only slight decomposition is caused by sulphur or by Bordeaux mixture. Certain " inert " dusts or diluents may cause decomposition owing to impurities, of which the most likely are iron oxides and the anhydrous chlorides of chromium, aluminium and iron.

The relative permanence of D.D.T., even on vegetation, has led to its use as a residual spray on a wide scale, particularly for the control of malaria-carrying mosquitoes, and for this purpose new methods of application have been developed or old ones modified. Spraying and dusting from airplanes is one such method. Several types of equipment have been tried, the aim of most of them being to project the spray or dust cloud in such a way as to make use of the air currents of the plane to distribute it in a good even swath where it is wanted. In this way under favourable conditions fairly accurate dosage can be

secured. These conditions include reasonably low wind speeds, absence of strong up-currents and manœuvrability of the plane.

Another method of " broadcasting " is that of atomizing, to " aerosol " degree of dispersion, by means of high-pressure steam. This method has been developed and patented in America. The apparatus is called a thermal generator and consists of a high-pressure " flash " boiler, pumps for delivering the oil solution of D.D.T. at the requisite rate, and nozzles. In its early forms, at least, it was fairly bulky and, with its fuel and insecticide supply, had to be towed on a small tender. It is placed up-wind and moved across so that the insecticidal mist is carried by the wind through the area of vegetation to be treated. Its success depends a good deal on favourable and dependable weather and the possibility of locating the generator correctly. It has one advantage over the airplane—viz., that it can be used at night when, generally, there are no up-currents to waste the mist. Many other interesting methods of dispersion have been tried, without as yet any great success. Examples are the use of smoke bombs and dispersion in engine exhausts. Improvements in the more conventional type of compressor and nozzle units, whether of the paint spray or whirling jet type, have so far proved more useful.

It may be of interest to mention a few of the many treatments with D.D.T. which have been successful besides those already referred to. Most of these must be regarded as still being experimental. The use of a 5 per cent. solution in refined light oil or a suspension in water leaves a toxic deposit on walls of warehouses, mills, grain bins, etc., and on walls of dwelling houses to kill mosquitoes and flies. Trial applications should be made to avoid unsightly marks. In hot countries screens can be painted, wall and ceiling surfaces near lights can be sprayed to kill sand flies. Rather heavier treatments are required against bed bugs. All the special harbourages should be treated, and walls as well, if practicable. A 5 per cent. spray and 10 per cent. powder or water suspension will leave a deposit giving a large measure of control of cockroaches.

In agriculture, Lygus, on sugar beet grown for seed, has been controlled by a 5 per cent. dust, with a great increase in yield of viable seed. A warning is given of the possible build-up of aphids. On cotton, Lygus control has been less satisfactory. However, dusting has given a good control of the bollworm and pink bollworm but not the boll weevil. A deposit on the walls of buildings, sheds, etc., has greatly reduced the fly population. The use of D.D.T. on fruit and most market garden crops is not yet advisable, except in the seedling stages when no harmful deposit can form—e.g., it can be used as a 5 per cent. dust in flea beetle control of seedling brassicas or against any insect pest of root crops. Its use as a 0·1 per cent. suspension watered round plants for the control of cabbage root flies, wireworm, onion fly and onion eelworm has given

variable results. A 3 per cent. dust or a 0·5-1 per cent. spray gives a useful control of carrot fly and of many potato pests. D.D.T. has shown promise in the control of pea and bean weevils. Its effect on the aphids generally has been poor, but there are possibilities of good developments. Apple-blossom weevil can be controlled by dusting with a 5 per cent. dust or a 0·1 per cent. spray. Many pests on domestic animals can be controlled, preferably by dusting or spraying with suspensions in water. If applied in the proper medium and at the proper dosage D.D.T. is not harmful to most plants. An exception is its damaging effect on squash, cucumbers, etc., and possibly, under some conditions, on tomatoes.

Benzene hexachloride, or hexachlorocyclohexane, was first prepared in 1824 by the action of sunlight on benzene and chlorine. Its toxicity to insects was discovered, independently, in France in 1941 and in England in 1942. Four forms or isomers have been isolated by Imperial Chemical Industries Ltd., who have also established that the toxicity is almost entirely due to the form known as the gamma isomer, which they have called "Gammexane." Pure Gammexane is a white crystalline solid. Crude commercial samples contain 10-12 per cent. of the gamma isomer; higher grade products are being developed.

The original product had an objectionable musty odour, which precluded its use indoors. In later samples this odour is much less noticeable. The "beta," "gamma" and "delta" isomers in the product are readily soluble in xylene, carbon tetrachloride or perchlorethylene. Emulsion concentrates can also be prepared, as well as aqueous dispersions and dilutions with inert dusts. Gammexane resembles D.D.T. in its chemical stability, but is slightly more volatile and is said to be somewhat less lasting when used as a residual deposit on vegetation, walls, etc. This volatility might well prove to be an asset in the treatment of soil for the control of insect pests, eelworms, and possibly for sterilization of harmful bacteria.

Gammexane belongs to the same type of insecticide as D.D.T. Experiments so far have been made with fewer pests, but some of the data are most encouraging and suggest that many useful results will be obtained from wider studies in due course. Gammexane is said to be about as toxic as D.D.T. to fishes and birds and to man and warm-blooded animals, but more data are desirable.

Briefly, it may be stated that Gammexane seems to be effective against many of the pests against which D.D.T. is effective. A very high degree of control of flea beetle on seedling brassicas has been obtained and interesting claims are made for its use in the control of wireworm.

Many other insecticides, mostly synthetic, have been claimed or patented, but experience with most of them is limited.

Finally, a few words must be said on the relation of the new insecti-

cides to the old, in particular of D.D.T. and Gammexane to pyrethrum and rotenone. There are three properties which must be compared. First, the safety with which the insecticides can be used. Pyrethrum, as an insecticide, is non-toxic to man and animals and to birds and fish and is not, of itself, injurious to plants. Rotenone and derris are only slightly toxic to man and the higher animals. Ingestion of the small amounts which remain on sprayed food is considered to be harmless, although protection should be provided for men working in derris dust. Taken orally, oil solutions are more toxic than dusts or suspensions. Fish are, of course, highly susceptible; plants are not injured. D.D.T. and Gammexane, whilst not acutely toxic to man and the higher animals, must be used with considerable caution, as already explained. They are injurious to a few species of plants.

Secondly, the type of insecticidal action of each. Pyrethrum is a contact insecticide and, to some extent, a repellent; so is rotenone. In addition rotenone and derris act as stomach poisons to some insects. D.D.T. and Gammexane are contact insecticides and stomach poisons. Further, pyrethrum, D.D.T. and Gammexane act on the insect nerves, but at extremely different rates, whilst rotenone inhibits the utilization of oxygen.

Thirdly, D.D.T. and Gammexane are much the most stable and give deposits which continue to kill insects after long periods of time.

From this comparison it will be seen that certain combinations of these materials have special value. For example, pyrethrum with rotenone gives, against some insects, a rapid paralytic action followed by a persistent lethal effect produced by the rotenone. Such a combination, too, is harmless to plants and to man and animals. Again, combinations of pyrethrums with D.D.T. or Gammexane give the same combined effect and are preferable against many insects—*e.g.*, mosquitoes, which it is essential to immobilize quickly to avoid bites, and flies, which are a nuisance unless quickly " knocked down." The flight-stimulating action of pyrethrum in low doses may also be turned to good effect in securing a more rapid pick-up of D.D.T., Gammexane, or other slow-action insecticide.

There is much new knowledge waiting to be applied and a certainty that further research will lead to further advances.

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WAR INTERLUDE

BY

W. L. FIELDING.

Empire Cotton Growing Corporation, South Africa.

Sometimes, in the rainy weather, when I look south-eastwards from the Cotton Station at Barberton, towards Lone Tree Hill and towering Saddleback Ridge, I am irresistibly reminded of the hill on which Cassino Monastery stood and of lofty Monte Cairo beyond. These local features appear and disappear through the low-lying belts of cloud as did those German strongholds of the Italian battlefield above the Allied smoke-screen which rose from projectors on the Rapido plain. Looking north, across the Barberton golf course, a bright red roof can be seen, surmounting a dug-in dynamite dump; one dark, wet night in 1940, F. R. Parnell and I kept vigil there, shotgun and rifle across our knees. . . . We were all in the local " Home Guard " and drilled on the parade ground in the town.

At one such parade we heard of Italy's entry into the war. The safety of British Colonial territories in Africa was now directly threatened, and the possibility of a thrust towards the northern frontier of the Union could not be ignored. South Africa's Active Citizen Force units were now mobilized, and the general enrolment of a volunteer army began. There was not then, nor at any time in the war, any form of conscription in South Africa. With the war thus come to the African theatre and with volunteers from all sections of the European and non-European communities leaving for the armed forces, members of the Corporation's staff then at Barberton sought permission to join up. This was granted in a cable from the Corporation's London office. Those were uncertain days, and it seemed possible that the Experiment Station might be put on a maintenance basis. In fact, however, the work continued, and those of us who returned to the work found a new interest in the range of hybrid cottons which had been produced in our absence.

The Editor has asked me for an account of some of my experiences in the Army during the war years. Before describing certain of these I feel that some reference to the military activities of others from the Barberton Cotton Station should be recorded.

R. C. Rainey was the first to don uniform; with a background of meteorological knowledge and his pet hobbies of flying and gliding, he was commissioned in the Met. section of S.A.A.F., and served in many campaigns throughout the war in this connection. G. M. Wickens and

J. Marshall were commissioned in the Food Technology section of "Q" Services Corps, and were engaged in the standardization and technical supervision of army supplies. J. B. McConnell, farm manager, saw service with the African Auxiliary Pioneer Corps, in the Western Desert and in Syria; whilst A. N. de Maine, secretary, served with "Q" Services Corps as an army supplies officer.

From the Plant Breeding Section, M. F. Rose, D. F. Ruston and the writer enlisted in the ranks of the South African Tank Corps, a new unit then being organized near Pretoria. Persuaded by recruiting propaganda we anticipated interesting times with armoured cars, machine guns and wireless, but many a day was to pass before such serious toys came to our hands. Attired in khaki drill slacks and shirts and with only the ill-fitting black berets on our heads to remind us that we had joined an armoured organization, we paced parade grounds by day and slept on heaps of dried grass spread over floors inches deep in choking white sand, by night—often ten men to a bell tent. The awakening to our new calling was a very rude one. An amusing memory is that of M. F. R. and D. F. R. on kitchen fatigue, sitting on upturned oil drums peeling carrots and potatoes by the bushel, utter dejection written on their faces!

The disillusions and discomforts of that early, disordered existence soon passed, and we found ourselves subjected to the more rigorous and disciplined life of an officer cadet at the South African Military College. We "went up" in a special over-thirty-years-of-age batch; potential Tank Corps subalterns were normally restricted to the under-thirty age group.

It was here that I parted company with my two colleagues, being on a different O.T.C. course from them and seeing little of them again till we returned to civil life. They were commissioned and saw action in the Western Desert with a S.A. armoured car unit. D. F. R. was later released from the army owing to an injury to his back, whilst M. F. R. finished as a Forward Conducting Officer with S.A. Public Relations, having wide and hectic experiences in the Mediterranean theatre.

The O.T.C. course seemed like four months of concentrated purgatory at the time, but it resulted in many good friendships, and looking back there is much to laugh over. Parades, lectures, examinations (practical and written), guard duties, P.T., route marches, spit-and-polish, and the final torment of the rehearsals for the ceremonial passing-out parade. For Saturday morning "stick" inspections even the soles of one's spare boots had to be polished and placed soles upwards amidst a glistening array of metal accessories which gleamed against the quieter background of pants, socks, drill tunic, toothbrush and shaving kit, all laid out in meticulous order on each cadet's bed. Then the ordeal of

inspection by the college commandant, when each cadet in turn would report . . . "Cadet number 12345 (etc.) Van de Merwe, J. P. (etc.), Sa-a-rrr" in stentorian tones. Any mistake in the sequence of this ritual pronouncement, the unwarranted twitching of a muscle or deflection of an eyeball from a rigid eyes-front position would provoke a storm of angry comment from the college sergeant-major, who watched with eagle eye.

Sometimes there was reaction to all this tension; there would be wholesale "bed-collapsing" raids by night and immersing of victims in a nearby horse drinking trough. The average age of the one hundred and twenty cadets on the course was only twenty-two years.

Duly "graduated" and commissioned, I went with brother subalterns to assist in the final manœuvres of two armoured car companies soon to go north to Abyssinia. We travelled under command of a major who was nicknamed "Mad Piet." Dashing from point to point in the beautiful Waterberg country of the N.W. Transvaal, our job was to stage "enemy" defensive positions covering road blocks in narrow mountain passes or at fords. The umpires would question us regarding our defensive plans and would criticize the reconnaissance activities of our attackers. We learnt a lot, and I found additional interest in the well-watered country and in the agriculture of the Springbok Flats which lie to the south of it. Meanwhile, "Mad Piet" was preoccupied with the welfare of a closed van which struggled to follow his personal staff car over that tortuous terrain. The van was stocked to overflowing with eatables and drinkables of all kinds. Sometimes we would round a corner in our vehicle to see old Piet's car parked under a bushveld tree in the midday heat, with the major tearing his hair out nearby:

"Waar is die panel van? Ek will 'n brandewyn hê," he would roar at us as we drew up. He looked after us very well.

It was now early 1941, and an odd chance caused me to embark on tactical intelligence work, a specialist military activity on which I was kept engaged till the end of my time in the Army. I went back to the Military College for many special courses, learning about topographical intelligence, astro-navigation, interrogation of prisoners of war, enemy weapons, tactics, army organizations and orders of battle. The German, Italian and Japanese forces came within the scope of the teaching. Memories were trained to become pigeon-holed from this point of view, and officers compiled indexed staff notebooks which proved of great value in the training of intelligence personnel and in making deductions in action. These books were kept up to date as new information came to hand. Training in scientific method was an excellent background for this new occupation; the natural awareness of country, which should be a constituent of the agri-

cultural research worker's make-up, proved useful in the study of the topographical information with which the field intelligence officer is so constantly concerned.

During the remainder of 1941 my unit, an armoured car reconnaissance formation, remained in Natal, much to the chagrin of all of us. However, the intelligence section was constantly out in the surrounding country, training itself and the unit in field craft. A study which engaged us was the tactics employed by British and Boer forces when the former crossed the Tugela River to attack the latter's positions on and around Spion Kop during the Anglo-Boer War. Maps were prepared and a plaster-of-paris model for indoor instruction. Finally, the progress of the battle was explained from the summit of the towering feature. To us it was a classic example of mistakes having been made through the inadequacy of topographical intelligence.

Towards the year's end an order to move came through. The regiment marched through the town of Ladysmith with band playing and flags waving. "Going north?" was the query on everyone's lips. Alas, back to base near Pretoria was the unit's fate.

Soon another fever of expectancy rustled through the camp. Equipment had been pouring in. One morning the regiment set out westwards, the long convoys of the armoured squadrons travelling at correct inter-vehicle spacing. By next day they were stretched across the *platteland* of the northern Orange Free State, the farmers in their little horse buggies and the dwellers in the dorps staring awestruck at the machine guns protruding jauntily from the turrets of *Oom Jannie's* armoured cars. One or two of us knew our destination but refrained from disillusioning the men, whose cheery, expectant faces peered out of the cars. Their faces were a memorable sight when the columns came to a stop alongside the tall wire of that camp where two thousand Germans from East Africa, South-west Africa and other parts were interned. . . . Then the tramp, tramp of the sentries, the oft-repeated, "Halt, who goes there?" as the officer of the guard went his rounds. Search-parties and roll-calls in the arena, escapes and captures, the medley of sounds when the band from a German liner was at practice, the chemical formulæ on the blackboard where a German professor lectured, and the circling walk of the internees, walking round and round, like animals in a zoo. Some of them wore leather shorts. There were old Huns with long beards and meerschaum pipes, there were doctors, lawyers, botanists, farmers and business men. They had their camp Fuehrer and Unter-Fuehrer.

Off-duty squadrons of the regiment manœuvred extensively in the surrounding country, giving the intelligence section ample scope for getting about. Often we were on the farm belonging to "Matabele Thompson's" people. I found the irrigation settlement in our area

which drew its waters from the Vaal-Hertz Weir of great interest. Wheat, potatoes and lucerne were grown. One impression was the rapidity with which the water-table rose, leading to waterlogging; the settlers had been unaccustomed to so much water, and some areas were an example of the necessity of strict control if land is not to be ruined.

A squadron of S.A.A.F. was with us there for a time, enabling the regiment to practise air co-operation and dispersal of columns when subjected to air attack. The "dive-bombers" dropped bags of flour and were often remarkably accurate. Sometimes I flew with them as observer, and one morning, after such a flight, I clambered from the cockpit to be handed an A.G. instruction to report to a brigade H.Q. near a village in Northern Natal lying close to the boundary line between Swaziland and the Union.

On arrival there I found myself appointed to the staff of an armoured brigade group as intelligence officer. It was early 1942, and, with the Japanese thrusting ever outwards, the possibility of a direct threat to South Africa's eastern seaboard loomed up. This armoured brigade group was under command of a mobile field force, one of the purposes of which was to act against such a contingency. Organization, training and manœuvres were soon in full swing; there were now four intelligence sections under my supervision and we travelled far and wide over the countryside. The problem of control of highly mobile formations in the field, and the passing of information forwards and rearwards over the air, by field telephone and by despatch rider, bristles with snags. Although this group was destined never to see action as a brigade, the field experience gained was invaluable. One task for the intelligence section was the making of reasonable scale maps of the area, so that certain manœuvres could be efficiently practised. These maps were based on a plane-table survey made after many an arduous climb to suitable hilltops, and the more intimate detail was plotted on to the master trace from compass-speedometer traverses. Copies were mass-produced from the master trace by means of a sun-print apparatus. Lying in the upper watershed of the Great Usutu River, the area was subjected to frequent rains and mists, which provided experience in moving wheeled columns over muddy terrain. Life in the wattle forests and middle-veld meadowlands was a new agricultural experience for me.

After the occupation of Madagascar and with the return of the 1st South African Division on leave from the desert, many changes took place in the Union's armed forces. Early in 1943 I received a new A.G. instruction, and on reporting to the headquarters of the 6th South African Armoured Division, then assembling near Pretoria, found myself appointed brigade I.O. to the division's motorized infantry. Once

again the gathering together of intelligence personnel and equipment had to be gone through—this time to function for infantry who would proceed sometimes on wheels, sometimes on foot. The sections were to be of larger size than those we had used with the armour. When the division sailed for Egypt in April there were many old pupils of mine scattered throughout the intelligence sections of the formation. We took with us a good store of the " I " man's essential apparatus.

Accompanied by destroyer and cruiser escort, the 6th Division convoy zigzagged over the oily waters of the Indian Ocean; sometimes land-based aircraft patrols flew overhead. The heat and smells of that crowded troopship are now a distant though unpleasant memory. The convoy deposited the division in Suez harbour, beneath the eroded heights of Gebel Ataqa, and sailed on to take part in the Sicilian invasion. A succession of trains, composed of bug-ridden coaches and box wagons, conveyed the troops across the Delta to a desert camp along the Alexandria road, where they were destined to spend many months. The enemy was finally driven from the North African mainland soon after the arrival of this new South African force in the Middle East. There was bitter disappointment, to which none of us was immune, at the prospect of more long waits, more organizing, more training before action would be seen. But an armoured division is too complicated and expensive a formation to throw into battle without the fullest training. So, through the heat of the Egyptian summer and on into the biting dry-cold of the winter, the South Africans marched, equipped and manœuvred. The facilities of the British Middle East military schools were made good use of by Springboks of all arms. Intelligence sections benefited greatly from the museums of enemy equipment and from the up-to-date teaching available. I was particularly fortunate in being able to take an intensive course in the interpretation of aerial photographs and in the plotting of objects from them on to the map; this knowledge often stood me in good stead in Italy when, for instance, my brigadier wanted to find a passage for his motorized infantry across terrain where no path was indicated on existing maps.

Divisional and brigade staffs spent a lot of time learning to work together, working out the " drill " for the handling of the complex formation in the field. Time was devoted to designing the fittings of mobile offices and command vehicles and to the training of N.C.O.s of the intelligence staffs to work smoothly in them with constantly changing maps, situations and general conditions. Hundreds of incoming and outgoing telephone and radio messages had to be decoded, logged and their import marked up on the situation maps if required. On the smoothness of working of all this depended the I.O.'s ability to dash off at any moment to give the latest picture of the battle at a brigadier's order group, or to prepare the information paragraphs

of an operation order. Everything had to be scientifically exact, in so far as available information made this possible.

Great use was made of large-scale sand models in teaching various types of conventional manœuvre. Intelligence sections in co-operation with sappers were always building them for brigade and divisional conferences. One of general interest represented a section of the Delta, with villages, canals, roadways and fields—the latter largely planted to cotton. On this model the river crossing "drill" was perfected from the staff point of view before the actual manœuvre was practised with troops on the ground.

An outside interest was to watch the sequence of agricultural processes in the Delta over a period of nearly a year. Sometimes, when spending an odd day in Cairo, I used to go out to the Cotton Research Board at Giza and chat with Dr. Balls in his laboratory, or wander round the spinning test-mill with Hancock, or go out for a look at the breeding plots with Brown.

In mid-April, 1944, the division sailed from Egypt, the prows of the ships in the convoy cutting into a cold mist which soon obscured the setting sun as it dropped towards the horizon ahead. A pleasant voyage, fresh and invigorating, and only once was there a real submarine alarm. The waters of Taranto harbour shimmered in the clear sunlight of the Mediterranean spring as the division disembarked on the Italian shore. In the background a bright green landscape dotted with brightly coloured buildings rolled away to a range of low hills. It did not seem possible that men fought each other, away to the north.

Arrived at brigade advance H.Q. at Gravina, there was short time to prepare. Our brigade was to move straight into the line, and I left next day for New Zealand Division H.Q., not far from Cassino, to carry out the preliminary reconnaissance work. En route were the flat, rich lands of Foggia plain, where maize grew and huge flights of bombers droned overhead. Further on, the upland grasslands of the Southern Apennines made pleasant country, though denuded of stock by Jerry. Nearer the line civilians had been removed from the battle areas, and the curious, ghostly silence of the countryside was only disturbed by the passing of an armed column and by the sounds of gunfire, reverberating through the mountains. The South African infantry were to relieve a Canadian brigade, then holding a sector of the Allied line facing the German Gustave line, north of Cassino, and would be under General Freyberg's command. I lived for a week at Cassino with the Canadians and New Zealanders, in dug-outs below the monastery, and went on reconnaissance with them. One night the South Africans moved in and the Canadians out, along narrow lanes and mountain tracks, in misty rain and through a pall of heavy smoke. Only the flashes of our guns lit the scene, and from time to time cascades of

German shells fell at odd points. The staff work was good and all went smoothly. Patrolling was directed from brigade H.Q. in a peasant's cottage, high on a mountainside. Sometimes we visited the forward lines by night; one could move little in that terrain by day, where Jerry had the advantage in observation from his mountain hideouts. The Springboks' job was holding and patrolling, and they were still carrying out this rôle when the barrage from 2,000 guns opened up on the night May 11-12, 1944, and the great and successful Allied attack went in against the monastery and the Rapido River crossings.

Soon afterwards, 6th South African Division, with a brigade of British Guards under command, set off, under Canadian Corps command, along the Liri River valley towards Rome. The dust and destruction around Pontecorvo, where the Hitler line was breached, were unforgettable. The South African contribution to the fall of Rome was a thrust from Highway 6, which drove the 26th German Panzer Division far to the north-east. Pulled back on to Highway 6, we then went in pursuit through Rome, where huge crowds of stunned-looking but cheering people lined the route. We crossed the River Tiber by the one bridge which the Germans had been unsuccessful in demolishing.

Under command of a British Corps, and with the French Corps of 5th Army on its left flank, 6th South African Division now became the spearhead of 8th Army in the advance from Rome to Florence. During this mobile thrust the South African infantry brigade, usually with a regiment of South African tanks under command, was carrying out attacking and pursuit tactics for practically the whole of the two months and more which it took to drive the Germans northwards, up the Tiber valley and on through the wooded hills and vineyards of Tuscany, to the Arno river. The British Guards fought on our immediate flank throughout.

This pursuit through difficult country was hard going, and staff work was exacting. One of the many charts kept at brigade H.Q. concerned bridges demolished by the enemy. In one three-mile stretch twelve major demolitions were encountered. The rapidity with which the South African sappers slung Bailey bridging across these gaps, often under heavy fire from enemy 88 mm. self-propelling and other guns, was most impressive. So, too, was the way in which the artillerymen constantly moved up their guns, giving excellent support to the advancing infantry. Main brigade H.Q. was nearly always sited just in front of the guns, an unpleasantly noisy position and uncomfortable when Jerry started counter-battery fire. Often we had a more mobile tactical H.Q. further forward with the advancing battalions, in order to maintain better control in wooded or hilly country where wireless communication was difficult at longer distances.

The German troops opposing us were constantly changing. Amongst others, we fought against the Hermann Göring Division and a Paratroop Division. It was interesting work keeping tag on enemy identities and dispositions. These were deduced after analysis and co-ordination of various types of information available to us. A little personal treasure of mine is a blue armband with the words HERMANN GÖRING woven on it in white. I found it in the clothing of one of a party of young Huns when examining them in a woodland glade one morning, in the forward areas; they had no paybooks or other means of identification and firmly declined to talk, but the armband gave us the first conclusive proof of the presence of this crack formation across our front. From a knowledge of their order of battle and fighting qualities we expected a tough time ahead. And we got it!

South African infantry were the first troops to enter the southern outskirts of Florence. Jerry had demolished all the bridges across the Arno, there, except the picturesque Ponte Vecchio, which, however, was in flames in part. Machine-gun nests were thickly posted on the northern banks, and our forward posts and rearward communications came under heavy fire from German long-range artillery. A halt was called to the Allied advance, and here my story must draw to a close. Soon after I had arranged and co-ordinated the patrols which carried out reconnaissance work (guided by maps and air photographs) for the crossing of the Arno west of Florence, I was sent back down the line to base hospital. Eventually transported to the Union by air, I was able to watch the country from the windows of various Dakota aircraft, right down Italy, across to Sicily, over the blue of the Mediterranean and on to heroic Malta. Then over Tripolitania and the old desert battlefields to the green fields and grey mud of the Delta. Southwards again the flight lay over the fields of the Sudan Gezira, and I saw R. L. Knight for a brief space when we landed at Khartoum. Presently the green swamps and cultivated hillocks of Uganda appeared to the west, and south of Lake Victoria the plane flew over Mwanza and Shinyanga to Tabora. From the height at which we travelled the waters of Lake Tanganyika appeared turquoise-blue in colour, contrasting with the dark green vastness of the indigenous forest round about. Heavy rain fell as the plane landed at Ndola, where thick bush surrounded the copper mines. Southern Rhodesia looked dry and almost barren from the air, and the cattle country south of the Zoutspanberg, in the Northern Transvaal, appeared green by contrast, although only light rains had fallen. The towers of the Union Buildings at Pretoria came into sight; it was the end of a journey which could not fail to make a lasting impression on any mind trained to observe agricultural and ecological phenomena.

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HISTORY OF COTTON IN THE UNITED STATES*

During the last half of the eighteenth century the inventions of Crompton, Hargreaves, Arkwright, and Cartwright had revolutionized textile manufacture in England. Spinning and weaving machinery operated by steam or water power, and the consequent introduction of the factory system, made possible mass-production of cotton cloth for a world market. Cotton fibre on an equivalent scale was needed. In colonial times cotton had been grown in the southern colonies, but only for domestic use. Soil and climate favoured the green-seed, short-staple variety, but separation of the seed from the lint was difficult, slow, and expensive because the fibre had to be cut or torn away. Sea Island cotton, a longer-fibred variety, was introduced in 1786. Its seeds were easily removed by running the fibre between rollers that revolved in opposite directions. Although Sea Island cotton brought high prices and was raised, often on a large scale, until the Civil War, the acreage devoted to it was limited, as it could be successfully grown only on the lowlands along the south-eastern coast.

The cotton gin invented by Eli Whitney in 1793 solved the crucial problem incident to large-scale production of the green-seed, short-staple cotton, and its invention marked a turning-point not only in southern agriculture but in American history. Upland or short-staple cotton became the largest commercial crop in the south and the basis of its economy. Each decade cotton production approximately doubled. In 1800, 73,222 bales of cotton were produced; in 1840, 1,347,640; and in 1860, 3,841,416. It overflowed the domestic market and became the largest single export of the United States. In the year beginning October, 1809, cotton represented 23 per cent. of the value of the total exports, or a little over $66,000,000; by July 1, 1860, it had increased to 61 per cent., or more than $333,000,000. Cotton fed not only the mills of old England but those of New England as well; a major item in the domestic trade was the exchange of southern raw cotton for New England manufactured cloth.

As the south concentrated more and more on cotton growing, it also offered a market for north-western grain and livestock products. Cotton expansion revived the moribund institution of slavery. In 1794 George Washington had written to a friend: " Were it not that I am principled against selling negroes as you would cattle in the market, I would not in twelve months be possessed of a single one as a slave.

* From " Farmers in a Changing World," *U.S. Yearbook of Agriculture*, 1940.

I shall be happily mistaken if they are not found to be very troublesome species of property ere many years have passed over our heads." The growing of cotton was very well adapted to unskilled, supervised gang labour; in the five years before the Federal prohibition of the slave trade became effective in 1808, South Carolina alone imported 39,000 slaves, and by 1860 its slave population increased to 57·2 per cent. of the total population. Another institution, the plantation, similarly became prominent, and the three together—cotton, slavery, and the plantation—exercised considerable influence over the political and social as well as the economic structure of the south.

Cotton growing centred first in the tide-water region of South Carolina and Georgia. The crop proved so profitable that many planters shifted to it from indigo and rice cultivation. Methods of cultivation were crude and wasteful, not because of slave labour, but because land was abundant and cheap. Squandering natural resources was as characteristic of the southern planter as of the western pioneer. Cotton growers reached out to the Piedmont of North Carolina and Virginia and then turned south-westward. The war of 1812, the acquisition of East and West Florida, and the removal of Indians to reservations beyond the Mississippi were, in part at least, due to cotton. The heavy black or brown loam soils in the Alabama-Mississippi Black Belt were found to be unsurpassed for cotton, and this region long remained the foremost cotton district in the world. Nevertheless the migration of cotton continued westward into the second area of great cotton production along the lower Mississippi. Even these conquests were not enough, and the land-hungry and restless pushed on to the prairie region of Texas.

Until 1821 over one-half of the cotton had been grown in Georgia and South Carolina. By 1850 Alabama ranked first, Georgia second, Mississippi third, and South Carolina fourth. In 1860 Mississippi, Alabama, and Louisiana produced over one-half of the total cotton crop in the United States, while Texas grew more than South Carolina. In the north, when the Atlantic seaboard states could not meet the challenge of western agriculture, industrialization was intensified; in the older south no such compensating factor was present, and economically it fell steadily behind the south-west. Land values declined, and Savannah and Charleston were supplanted by New Orleans and Mobile as trade centres. Even by 1820 the areas first devoted to cotton presented a sorry picture of eroded lands, bare of vegetation except for scrubby growths. The south-west blamed its decline on the tariff, the Federal banking policy, the lack of credit facilities, and heavy taxation. All these factors were present, but they did not constitute the crux of the problem. The fundamental difficulty lay in the too-rapid westward expansion. Had there been planned

control, southern development might have taken a different course. The states of the South Atlantic seaboard did attempt to adapt themselves to changing conditions. Leaders like William Gregg and James Hammond stressed the need for industrial diversification, and a number of textile mills and iron foundries were established. The movement did not progress far—despite hundreds of books, resolutions, and conventions—because the capital available was too closely tied up with landed investments, while the labour supply, whether slave or " poor white," needed wholesale readaptation.

It was only after the Civil War, when its agriculture lay in ruins, that the south turned to industry on a large scale. As an alternative to industrial development, an attempt was made to establish the south-east as the trade centre for both the south-west and the north-west. Although canals and railroads were built, only a meagre success in serving the hinterland was achieved. The south-west developed its own ports, and the north-west became tied to the north-east by the railroads. Attempts were also made to adjust and reform the agriculture of the Old South to the changed conditions. John Taylor, of Carolina, sought to halt the retardation of Virginia agriculture, and Edward Ruffin sounded an even more clarion call to action. His teachings won for him the title " father of American soil science," but they failed to stay the tide.

When the Old South first felt western competition it found itself with too much slave labour. Transfer of that surplus westward only strengthened the competition. Finally, in the forties and fifties, when labour was needed for agricultural diversification, slaves were scarce. The Old South could not afford to pay \$1,000 to \$1,400 for a prime hand, and was outbid by the south-west, where fertile lands yielded a much greater output per unit of labour. In desperation the south-east sought a reopening of the slave trade; though the attempt failed, slave smuggling probably was increased. More important for later development was the fostering of progressive methods such as deeper ploughing, the introduction of new crops, the increased use of labour-saving devices, and the importation of improved breeds of livestock. Agricultural journals and societies were begun and fairs and exhibits held. General farming became a prominent feature of the agriculture of the Border States, and just prior to the outbreak of the Civil War Virginia achieved a moderate prosperity as a result.

EMPIRE COTTON CROPS FOR THE YEARS 1935–1945, EXCLUDING INDIA.

(In bales of 400 lbs.)

The seasons are given as covering two years (*e.g.*, 1934–1935) because in the majority of the countries named planting takes place in one calendar year and picking in the next. In a few of these countries, however (*e.g.*, Tanganyika, Cyprus, Malta and some of the West Indian Islands), the crop is harvested in the same year as that in which it is planted. In such cases the figures should read as relating to the crop grown and harvested in the *latter* of the two years at the head of the column.

Country.	1934–35.	1935–36.	1936–37.	1937–38.	1938–39.	1939–40.	1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	
(1) Anglo - Egyptian Sudan	296,131	248,285	332,687	331,639	331,104	292,706	319,682	295,107	354.109	222,877	374,296	(1)
(2) Uganda	253,242	321,348	338,391	417,179	303,893	296,672	368,898	236,370	112,849	191,870	272,064	(2)
(3) Kenya	8,773	15,783	22,166	19,610	9,976	11,622	15,094	12,269	5,453	6,330	5,384	(3)
(4) Tanganyika ..	58,540	67,369	61,783	44,636	64,106	65,314	72,766	51,017	38,309	24.797	41,408	(4)
(5) Nyasaland ..	21,006	13,730	13,908	17,358	5,276	6,526	5,376	14,392	5,552	8,450	8,302	(5)
(6) N. Rhodesia ..	—	—	—	43	77	68	78	75	39	20	23	(6)
(7) S. Rhodesia ..	566	329	530	338	82	408	433	1,938	1,464	1,657	1,227	(7)
(8) Union of South Africa and Swaziland	2,966	1,983	3,397	1,132	747	2,061	1,857	854	584	664	338	(8)
(9) Nigeria	58,851	60,076	47,554	31,636	24,057	50,632	73,295	36,119	32.494	24,618	15,818	(9)
(10) Gold Coast ..	146	128	145	4	5	6	17	20	50	137	—	(10)
(11) Cyprus	5,214	2,993	4,670	2,151	1,705	1,735	722	1,589	1,661	1,341	2,380	(11)
(12) Malta	20	32	32	26	28	27	—	—	—	—	—	(12)
(13) Ceylon	124	293	369	355	196	261	452	430	46	107	10	(13)
(14) Queensland ..	17,653	16,631	10,649	11,935	15,457	10,319	14,296	12,312	8,364	7,366	1,627	(14)
(15) Fiji	29	64	65	60	7	45	38	—	—	—	—	(15)
(16) West Indies ..	4,720	4,565	4,676	6,196	5,636	8,492	9,312	7,450	4,555	4,099	4,525	(16)
	727,981	753,609	841,022	884,298	762,352	746,894	882,316	669,942	565,509	494,333	727,402	
	Percentage Increase 30·2	*Percentage Increase* 3·5	*Percentage Increase* 11·6	*Percentage Increase* 5·1	*Percentage Decrease* 13·8	*Percentage Decrease* 2·3	*Percentage Increase* 18·1	*Percentage Decrease* 24 0	*Percentage Decrease* 15·6	*Percentage Decrease* 12 6	*Percentage Increase* 47·1	

NOTES ON CURRENT LITERATURE

COTTON IN INDIA.

181. Indian Cotton Textile Industry: Prospects. By L. R. Mehta. (*Ind. Text. J.*, **56**, 1945, p. 222. From *Summ. Curr. Lit.*, xxvi., **8**, 1946, p. 177.) The present position of the Indian textile industry is reviewed. Statistics on production, disposal of manufactured goods, and the profits gained or losses incurred by the industry are given for the years from 1938 onwards, and show that during the war India's textile trade was highly prosperous. The immediate tasks and future prospects of the industry are discussed. The urgent needs for new and up-to-date machinery, for dispersal of industry, for supply of electric energy at cheap rates, for skilled labour, and for the establishment of research laboratories, are stressed. India has a good home market, but it is considered doubtful whether the country will be able to maintain the foreign markets, due to the lack of public corporations. Man-made fibres may become a great menace to the Indian industry.

182. Indian Cotton Mills: Post-War Construction and Lay-Out. By T. V. Baddeley and Sir Frederick Stones. (*Ind. Text. J.*, **56**, 1946, p. 304. From *Summ. Curr. Lit.*, xxvi, **9**, 1946, p. 184.) The report of the Government of India Planning Committee (Textiles)-Sub-Committee on "Minimum Standards for Buildings, Spacing of Machinery, Lighting, Humidification, and other conditions affecting the Health and Comfort of Operatives in the Post-War Period" is reproduced with illustrations and appendices. The main topics in the 94-paragraph Report are: (1) Modern building construction for cotton mills, (2) Spacing of machinery, (3) (3) Lighting, (4) Humidification (including ventilation, dust removal, etc.), (5) Other amenities (drinking water, sanitation, fire prevention, etc.), and (6) Summary of recommendations. The appendices include large plans, a safety colour code, and technical papers on humidification.

183. Indian Cotton Mills. (*Cotton*, M/c, 11/5/46.) The annual statement for the cotton season ended 31st August, 1945, of the Bombay Mill-owners' Association shows that during the season the total number of cotton mills in India increased by ten, to 417, and that the paid-up capital of the industry rose by some Rs. 164 lacs to Rs. 5,435 lacs. The number of spindles installed rose by about 16,000, to 10,238,000, though the number actually working fell by about 28,000, to 9,466,000; the number of looms installed rose by about 600, to 202,000, and the number working rose by about 1,400, to 190,600. The statement for the current season should be more than usually interesting, because it may be expected to show some results of a movement which is now in progress. A great many new companies have been formed for the manufacture of cotton goods and, while nearly all of them contemplate spinning and weaving, some also intend to engage in finishing, and one or two even intend to gin their own cotton.

184. Indian Cloth Supplies: Distribution. Textile Commissioner, Bombay. (*Ind. Text. J.*, **56**, 1945, p. 15. From *J. Text. Inst.*, xxxvii, **3**, 1946, A138.) The Government machinery set up in India to ensure the supply of a specified minimum quantity of cloth per head of population is described and its activities are displayed in a series of charts and statistics. The Indian textile industry increased its production by about 30 per cent. during the war years.

185. Indore Institute of Plant Industry: Progress Report of the Cotton Genetics Research Scheme, 1944-45. See Abstract 296.

186. A Large-Scale Yield Survey on Cotton. By V. G. Panse *et al.* (*Curr.*

Sci., **14,** 1945, p. 187). A detailed description of a large-scale survey carried out on cotton in the Central Provinces and Berar during the 1944-45 season. The survey, which was spread over 29,342 square miles and covered nearly three million acres of cotton, provided for the first time the means of estimating the average yield per acre and total production of cotton in the province by a scientific objective process. The sampling technique adopted is described. The ultimate goal of such surveys is the introduction of the random sampling method as a permanent feature in the estimate of crop yields.

187. Bias in the Use of Small-Size Plots in Sample Surveys for Yield. By P. V. Sukhatme. See Abstract 267.

188. India: United Provinces Textile Industry Development. By H. B. Shroff. (*Ind. Text. J.*, **56,** 1945, p. 229. From *Summ. Curr. Lit.*, xxvi, **8,** 1946, p. 177.) The consumption of cotton by mills in the United Provinces is on the increase, but there is a sharp decline in cotton production. Figures are given showing the yearly output of yarn and cloth by the mills during the periods of the two world wars, and the war-time changes in production of qualities of yarns and cloths. The handloom industry in the United Provinces is described and its difficulties discussed. The need for the rationalizatiom of the industry is stressed.

189. Indian Central Cotton Committee. At the meeting of the Committee held from 28th January to 2nd February last, under the chairmanship of Sir Herbert Stewart, the following, among other matters, were discussed:—(1) The urgent need for crop planning owing to the precarious food position; (2) the necessity for decreasing the cost of production of cotton. In this connection Sir C. V. Mehta stressed the need for improvement in the seed supply, better manuring and cultivation of the crop, and increased payment of research workers. It was also decided at the meeting that the pre-war lashings of cotton bales should be resumed.

COTTON IN THE BRITISH EMPIRE (EXCLUDING INDIA).

190. British Cotton Growing Association. The Forty-First Annual Report of the Association, to December 31, 1945, states that after three successive years of decreases in production of cotton in Empire fields (excluding India) it is gratifying to be able to record a considerable increase in 1945. The total of 730,000 bales is an increase of nearly 50 per cent. over 1944, nearly 30 per cent. over 1943, and about 9 per cent. over 1942; the result being in the main due to a record crop in the Sudan and a recovery in Uganda. At the same time it must be recorded that the figure is some 80,000 bales below the average of the six-year period 1936 to 1941, and 150,000 bales below the peak years 1938 and 1941. While welcoming the recovery it is as well to remember that conditions imposed by the war on the different countries still prevail, and production cannot be expected to return immediately to the peaks mentioned above. All these cotton-growing countries are also producers of food, and are being called upon to help in meeting the food scarcity in Europe and Asia. The necessity of giving first consideration to food production has, therefore, been even more intensified than during war years.

During the season under review the B.C.G.A. (Punjab) Ltd., controlled 133,056 acres in the Punjab, Bahawalpur and Sind, cotton and wheat being the chief crops. Eleven ginning factories were in operation, as well as three mills for seed crushing and the production of cottonseed oil and cottonseed cake. The cotton crop at Khanewal Farm was good both in quantity and quality; yields were low in Sind, due to pink bollworm and jassid; in Bahawalpur the crop was late and, in consequence, suffered from severe frost in December. Over 2,200 tons of cotton seed of long staple type were sold, sufficient for planting 241,000 acres.

191. ASIA. Cyprus: Cotton Spinning. (*Crown Col.*, April, 1946, p. 300.) A cotton spinning factory, recently opened under Government auspices, is already producing 5,000 lb. of yarn each week. The factory, which was built at a cost of £70,000 to help make good the acute clothing shortage, uses locally grown cotton. In his speech when he opened the factory H.E. the Governor said that in spite of all her

other troubles England had supplied the machinery and sent an expert to the island to get the factory going. He added that cotton equal in quality to the standard English yarn was being produced, although Cyprus cotton has a short, uneven staple. The factory already has 120 employees and within a few months should have 200.

192. SAVE THE SOIL. By L. J. S. Littlejohn; illustrated by D. L. Izod. (Dpt. of Agriculture, Cyprus. Received, 1946.) A popular account, written in English, modern Greek, and modern Turkish for the benefit of the Cypriot cultivator, dealing with the menace of soil erosion in Cyprus, and suggesting measures for conserving the soil by means of reafforestation, terracing, belts of natural vegetation, contour banks, etc. Several useful diagrams are included.

193. COTTONS FOR THE EAST. (*Crown Col.*, April, 1946, p. 270.) Lancashire exporters of cotton piece-goods, who before the war looked to the East for a substantial proportion of their turnover, are naturally pleased to receive from the Cotton Board allocations for one or more of the group of markets comprising British Malaya, British North Borneo, Hong Kong, and Burma. The allocations are based on the actual shipments of individual exporters during 1940, and they provide for very much more than a token trade. It now rests with merchants to demonstrate that the claims made for the improvement which merchant-to-merchant dealings would accomplish were well-founded. The Cotton Board specify for each of the four markets a list of cloths which are wanted. Clearly, it is essential that the widest possible spread-over of these types should be achieved from the allocations. There is an obvious incentive to merchants who have free stocks of the types concerned, which can be shipped quickly, to meet part of their allocations from stocks, using their allotment for replacement purposes. Importers will be no less anxious than the authorities to be informed immediately what supplies they may expect.

194. AFRICA. WEST AFRICA. MEETING TEXTILE DEMANDS. (*Crown Col.*, March, 1946, p. 197.) Despite the fact that Lancashire was pouring out her products for the equipment of the British army and of less fortunate countries which had been overrun, in 1940 more than 50 per cent. of the pre-war average of cotton and rayon cloth was sent to West Africa. In 1941, after this country had suffered from uninterrupted aerial bombardment, there was a slight fall, which persisted in 1942. Thereafter, however, the Control ordered that an extreme drive be made to supply textile fabrics to West Africa in view of the prodigious efforts being made there to assist the British war effort by increased production of primary commodities. This resulted in nearly two-thirds of the pre-war figure being sent in 1943, and even more in 1944. The position in 1945 was not quite so good, but now that weavers are returning and the "closed mills" are re-starting, it may be assumed that it will not be long before the full supply is sent.

195. NIGERIA: COTTON INDUSTRY, 1944-46. (*Half-Yrly. Rpt. to September*, 1945.) *Northern Provinces.*—The cotton crop of the Northern Provinces for the 1944-45 season amounted to 13,222 bales of 400 lb., and included eleven bales disposed of locally for medical and veterinary purposes. There was an improved percentage of Grade 1 cotton, due to the early cessation of the rains, and consequently less damage to the ripening bolls.

The total amount of seed distributed for the 1945-46 season amounted to 4,349 tons, or nearly 400 tons more than in the previous season. The policy in regard to the campaign for maximum groundnut production remained unchanged, and affected cotton production chiefly in the northern parts of Sokoto and Katsina Provinces, and in Bauchi and Kano Provinces. Excellent rainfall throughout July, August, and September, which in distribution compared well with the record year of 1940, assured a considerable increase in seed cotton for purchase during the current season.

Southern Provinces.—The Ishan cotton crop of 1944-45 amounted to only 2,596 bales, a considerable reduction on that of the previous season. There was an improvement in quality. Prices paid for the crop ranged from 17s. 6d. per cwt. for the highest grade, N.1, to 10s. 6d. for the lowest, N.N. It was reported, during the buying

season, that prices higher than these were being offered for cotton for the local weaving industry in Oyo Province.

Ishan seed distributed for the 1945-46 season amounted to 150,700 lb. The growing crop was reported to be adversely affected by drought in July and August, but it was hoped that heavier rains in late September and early October would promote better growth.

196. Progress Report on Cotton Growing for the Season 1944-45. (*Prog. Rpts. from Exp. Stats.*, 1944-45.) *Northern Provinces.*—Rainfall during the season was the lowest on record; this caused poor yields on many native farms where planting was late. On Government farms, however, yields were satisfactory, as the crop was planted in good time. The export crop was low because of the greatly increased local consumption as a result of a fall in the quantity and quality of imported cotton goods during the war. The cotton seed multiplication scheme was continued. From the point of view of yield, the improved strains and mixtures have done well, and samples have been sent as in previous years to the Shirley Institute for spinning tests. The main point in favour of the improved strains is the increased ginning percentage. In a variety trial carried out at Daudawa the strain Daudawa 43 yielded the highest amount of lint per acre. In a trial at Samuru strains 26c. and D30 gave the highest lint yield, and were significantly better than Commercial Allen.

Southern Provinces.—Weather conditions were favourable and yields were fair, about 400 lb. seed cotton per acre. Progeny row selection on the basis of lint qualities, halo length and ginning percentage was carried out for the maintenance of purity of Ishan A. 32 progeny rows of 40 plants each were established. All plants were self-fertilized and 8 selections were made for planting the yield trial test block of next season. Results of lint measurements showed no significant difference between the open and self-pollinated strains of Ishan; this agreed with the result of the yield trial in 1943-44. *Helopeltis* attack was again severe, but was reduced by daily hand-picking. Efforts are being made to control pink bollworm, which destroyed about 15 per cent. of the cotton seed during the season. There were also some cases of leafcurl.

197. Nyasaland: Cotton Prospects, 1945-46. (*Overseas Rev.*, Barclays Bank, April, 1946.) The prospects for the cotton crop are reported to be good, and production is expected to exceed last season's figures.

198. Work of the Domira Bay Station, 1944-45. (*Prog. Rpts. from Exp. Stats.*, 1944-45.) The new range of C.L.20 derivatives, which it is hoped contain a fair measure of blackarm resistance, entered the multiplication plot stage during the year and were compared in two small bulk trials with the best Mz.561 derivatives and certain other cottons. The latter included the U4 × Cambodia × U.4. crosses, N.C.4 and N.C.7 and with these was sown a range of the same parentage from Barberton. Also included were the Malwa Upland cross with U.4, numbered A.2208, from Barberton, and B.P.52 from Uganda. In spite of bollworm attack yields were good and the seed cotton grade quite fair. Leading places were taken by Mz.561 and C.L.20 selections, with Mz.561 bulk equal first in both trials in yield of seed cotton. T.22, the longest linted derivative from Mz.561 is probably an improvement on the parent bulk. Of the C.L.20 derivatives which showed much promise, C.L.20-46 gave the second highest seed cotton yield in its trial, 908 lb. seed cotton (275 lb. lint) per acre as against 850 lb. seed cotton (263 lb. lint) per acre from Mz.561 bulk. The Nyasaland Upland derivative B.P.52 did rather better in the trials than its bulk performance would have suggested, with a calculated yield of 610 lb. seed cotton (195 lb. lint) per acre. The Nyasaland versions of the U.4 × Cambodia × U.4 cross were close to the leaders in the yield table, but those of the same parentage from Barberton proved rather disappointing, only one of the latter, A.250, being comparable in yield. The Malwa Upland cross, A.2208, gave the same yield as A.250. B.181, obtained from Uganda, was sown in an observation plot with excellent results. This cotton combines high resistance to both blackarm and wilt, and is worthy of further trial. The work of the Insect Pest Control

Section on the major pest of cotton, red bollworm, was concluded, and a report on it by Mr. Pearson and Mr. Mitchell was published by Government in July, 1945.
[*Cf.* Abstr. 333, Vol. XXII. of this Review.]

199. Northern Rhodesia. Cotton Production, 1944-45. (*Ann Rpt. Dpt. Agr.*, 1944. Received 1946.) Cotton production declined in the Marambo area of the Luangwa Valley. There were 220 growers, and the total crop amounted to 27,000 lb. seed cotton. The average receipts per grower were around 12s.

200. Southern Rhodesia: Work of the Cotton Breeding Station, Gatooma, 1944-45. (*Prog. Rpts. from Exp. Stats.*, 1944-45.) Rainfall was sparse and inadequate in November and December and was responsible for poor plant stands in cotton. Crop loss previous to and during the first few weeks of flowering was largely due to attack by Sudan bollworm, but the more evident and greater damage was caused by American bollworm from about the end of March. That this latter was not more pronounced was due in great measure to the fact that maize in full tassel about mid-February took a good proportion of the early egg-laying just previous to the time that cotton was about to commence flowering. Other pests encountered during the season were jassid, spiny bollworm, stainers, aphis, termites, and root-knot nematode.

The ancestry of the present cotton strains bred at Gatooma by continuous selection is traceable to two main family groups, namely, U.4/64/7/10 and U.4/64/V. These strains were taken as selections in 1930, and were both issued to growers in the 1932-33 season. They replaced in commercial cultivation their parent U.4/64, one of the first selections of the U.4 Mixed Bulk seed obtained from Barberton, and grown at Gatooma for the first time in the 1927-28 season. Of the two strains at present in commercial cultivation, 9L18 is descended from U.4/64/7/10 families, whilst 9L34 is derived from a U.4/64V family. Doubt was expressed as to whether 9L34 would prove a better yielder than 9L18, but there was little to choose between the strains during the season. On the question of lint quality, however, 9L34 and related strains easily lead the field, not only against 9L18 but even more so against the large group of Gatooma cross-bred strains. Six Barberton cross-bred strains having either Cambodia or Mu8A as the one parent with Barberton U.4 as the other were grown in observation plots for the second consecutive season. Those with Cambodia parentage made a very promising beginning, but during the course of the season appeared to shed their crop readily. They have, however, a high degree of jassid-resistance with good quality lint, and will be grown again for further observation.

201. South Africa: Work of the Cotton Experiment Station, Barberton, 1944-45. (*Prog. Rpts. from Exp. Stats.*, 1944-45.) The season was one of the most difficult on record since work commenced at the station, on account of the low and badly distributed rainfall, coupled with uniformly high mean maximum temperatures during the growing season. The total rainfall for the twelve months ending June 1945 amounted to 18·93 inches, compared with the mean of 28·14 inches for the 21 years since the establishment of the station. The main breeding work was again confined to variety tests of, and selection within, hybrid material bred in previous seasons. Details of the object of this work and the material used were given in the introductory note for the 1943-44 season.

A balanced incomplete block trial of 25 strains by 12 repetitions was carried out to compare the yields of the 19 best U.4×Cambodia strains, as judged on previous seasons' results, with two U.4×M.U.8 and the four best U.4 strains, including U.5143, the strain in general cultivation in the area. For the second successive year and under completely different climatic conditions the best Cambodia crosses far out-yielded the four U.4 strains. Of the 19 in the trial 13 were significantly better than the best U.4 strain, while 16 of them, and the two M.U.8 crosses, gave significantly higher yields than 5143. The Cambodia×U.4 strain, A.2106, again gave the highest yield in the variety trials, far outyielding 5143 and being considerably more jassid-resistant, while its lint was in no way inferior. Seed of this strain has been issued to selected farmers for multiplication during the coming season, with a view to replacing 5143 in general cultivation.

Investigation into the relationship between hairiness and jassid-resistance was continued in *hirsutum*, *barbadense*, and *hirsutum*×*barbadense* material. The jassid population during the season was very high, and enabled satisfactory progress to be made in the selection of resistant types.

An attack by Sudan bollworm (*Diparopsis castanea* Hamps.) on October-planted cotton damaged the early bolls. Stainers were numerous quite early in the season, but for the third consecutive year the incidence of internal boll disease was very low.

[*Cf.* Abstr. 335, Vol. XXII. of this Review.]

202. South African Council for Scientific and Industrial Research. (*Nature*, 18/5/46, p. 652.) An initial statement of the objects and policy of the South African Council for Scientific and Industrial Research, issued in December, 1945, emphasizes the need for research in South Africa and points out that it has become essential for the Government to establish an organization to advise it on the best method of developing resources in scientific man-power and equipment for research to the full to co-ordinate scientific research for the national welfare and to take charge of certain developments which it considers are badly needed. The Council is to consist of a full-time president and nine members chosen for their eminence in science and industry, and its functions and powers will be similar to those found necessary for equivalent bodies by Great Britain, Canada, Australia, and various Continental countries. The basic revenues will be derived from a Parliamentary vote, but a substantial income is also anticipated from other sources, and among the subjects for the development of which it is hoped gifts will be forthcoming are research in medicine and national health, special research fellowships, travelling research fellowships, and scientific research institutes, some of a Pan-African nature, in such subjects as meteorology, geochemistry, marine biology, ecology, genetics, nutrition, tropical diseases, oceanography, and entomology. Estimating that South Africa is at present spending about one-sixth of the amount which, in comparison with other countries, it should be spending on research, the statement suggests that industry itself in the country should be expending £12,000,000 a year on industrial research, leaving the State to provide £3,000,000 for research in other directions. A small number of national research laboratories will be required to take over the long-range type of investigation, and the Council proposes to establish immediately a national physical laboratory, a national chemical research laboratory, and a building research laboratory. It plans to foster the development of research in universities and similar institutions and to create conditions under which the best science students can be offered a reasonable livelihood in scientific investigation. It is proposed to develop an information service as a central library and information bureau of the Council, and to establish scientific missions in London, Washington, and other centres.

203. Erosion and Soil Conservation. By J. P. van Aartsen. (*Int. Rev. Agr.*, xxxiv., **5**, Rome, 1943, 153T.) Chapter I deals with the nature and consequences of erosion, and outlines the present survey. The succeeding chapters discuss the natural setting; the historical and economic setting; special forms of erosion; soil conservation measures.

204. Sudan: Cotton Textile Imports. (*Overseas Rev.*, Barclays Bank, April, 1946.) Stocks of cotton piece goods during the month of April were still reported small, on account of the large distribution made in January, but the position should improve as a result of anticipated new arrivals from both the United Kingdom and India. Arrivals from the U.K. are more or less regular; these shipments are being received against orders placed in 1944-45 in the U.K. In India, the export ceiling prices for cotton piece goods destined for the Sudan remained in force. It has been announced by the Controller of Supply that there will be no allocation of cotton yarns *ex* India for the Sudan in 1946, and that previous allocations were being utilized in India for the manufacture of cotton piece goods.

205. Sudan Plantations Syndicate: Report for 1945. (*E. Afr. and Rhod.*, 2/5/46, p. 886.) The report of the directors of the Sudan Plantations Syndicate, Ltd., presented at the 38th General Meeting of the Company in London on May 2, drew attention to the fact that the cotton crop harvested in 1945 was one of the

largest in the history of the Syndicate, which was deprived by taxation of most of the additional benefit which would otherwise have been reaped. A dividend of 10 per cent. and a bonus of 12 per cent. were declared. The report announced the resignation as Chairman of Sir Alexander MacIntyre, whose place has been taken by Mr. H. Wooding, previously Managing Director. Tribute was paid to the work of Mr. W. P. Archdale, who in September retired from the position of Manager in the Sudan, where he has been succeeded by Mr. A. Gaitskell. The issued share capital of the Syndicate is £2,475,000. General reserve appears at £707,018, while the Gezira sinking fund and reserve fund accounts together total £1,695,789. Under the terms of the concession the sinking and reserve fund accounts will be taken over by the Sudan Government as they exist on the expiry of the concession. The Government is to take over the fixed assets of the Syndicate at cost in 1950.

206. KASSALA COTTON COMPANY, LTD. (*E. Afr. and Rhod.*, 2/5/46, p. 886.) The report of the Kassala Cotton Company Ltd., states that the harvesting of one of the largest crops in the history of the company has permitted an increase in the bonus from 2 to 5 per cent. During the year Mr. H. Poyntz Wright was appointed a director in place of the late Lord Lugard. The issued capital is £300,000. The profit for the year ended June 30, 1945, amounted to £142,117, compared with £68,640 in 1944. Taxation on current profits absorbed £77,500. The dividend of 10 per cent. plus bonus of 5 per cent., amounted to £45,000, less income tax of £20,250.

207. SURVEY OF THE ANGLO-EGYPTIAN SUDAN, 1898-1944. By K. D. D. Henderson. (Longmans, Green and Co., London, New York, Toronto, 1946. Price 1s.) An Introductory Historical Note is contributed by E. N. Corbyn, Sudan Political Service (retired). The " Survey " following this Note is the story of the Sudan, as built up under successive British Governors-General in the 46 years from 1898, and in this story all the following matters are discussed: Public security; farming; forestry; stock; public health; revenue; the Gezira Scheme; other cash crops; trade communications; education; higher and secondary schools; intermediate and elementary schools; girls' education; education in the south; technical education; the administrations; the road to self-government; the economic future.

The author writes that the many problems concerned with the economic future of the Sudan have been studied, and proposals to deal with most of them laid before the Advisory Council. The Board of Economics and Trade has been reconstituted to carry them into effect. In the process of finding an alternative livelihood for the people dispossessed by the Jebel Aulia Dam the Government has gained valuable experience in community settlement on irrigated land. The Soil Conservation Committee has produced a Five-Year Plan at an estimated cost of £E.300,000, which includes proposals for limiting the size of villages and herds, carrying out a comprehensive water survey in areas suitable for development, and experimenting with anti-erosion devices for the protection of the soil against the ravages of wind and rain, fire, men, and animals. Other committees have been busy with schemes for the improvement of village life and housing, and for the preservation and improvement of such native crafts and industries as survive. New industries are being introduced, where there is a reasonable chance of post-war survival, to replace imports lost owing to the war. A Demobilization Committee is preparing for the absorption of the men of the Sudan Defence Force (now many times its pre-war strength), who will return from Libya and Eritrea with new standards to be satisfied and a wider knowledge of the world. This Committee recommended, and the Advisory Council endorsed the recommendation, that every province should work out its own schemes for post-war agricultural development, into which the ex-soldier can be absorbed, and the establishment of machinery to deal with the labour problems which are now presenting themselves for the first time. Lastly, a comprehensive scheme of development has been drawn up for Equatoria Province, and data are being collected with a view to deciding what can be done with the vast swamps of the Upper Nile.

In conclusion, the author pays tribute to the great efforts made and the help rendered by the people of the Sudan during the five war years.

The inclusion of several excellent photographs and two maps lends added interest to the survey.

208. Sudan Gezira Soil: Nitrification. By T. N. Jewitt. (*J. Agr. Sci.*, **35**, 1945, p. 264. From *Summ Curr. Lit.*, xxvi, **6**, 1946, p. 119.) The result of laboratory work on the rate of nitrate production in the soil of the Sudan Gezira is recorded, with some reference to its influence on the cotton crop. The nitrification rates of the soil's own nitrogen, ammonium sulphate, and certain organic nitrogen compounds have been studied. It is shown that the nitrification in this soil is substantially normal, with no striking difference from that in soils of other arid regions.

209. Tanganyika Territory. Cotton Prospects, 1946. The report of the Dept. of Agriculture for March states that rainfall during the month, practically throughout the Territory, continued to be inadequate for crop needs and was unevenly distributed. The exception was the high altitude area of the Southern Highlands. In the Eastern and Southern Provinces very little cotton has been planted, owing either to preoccupation in replanting food crops or unsuitable planting weather. The Lake Province plantings have received barely sufficient rain to be maintained, and planting continues in parts. Cotton prospects generally elsewhere are not unfavourable.

210. Cotton Prospects, 1946. (*Overseas Rev.*, Barclays Bank, April, 1946.) Prospects for the new season's plantings in the Lake Province are greatly improved following good rains which have fallen this month.

211. Work of the Experiment Stations, 1944-45. (*Prog. Rpts. from Exp. Stats.*, 1944-45.) *Ukiriguru and Lubaga.* Heavy rains at the very end of the season brought the seasonal totals to something like average, 28 inches on Ukiriguru and 31 inches on Lubaga. Distribution, after an early start, was poor. The late rains helped cotton yields considerably, especially in the south, where the resultant top crop was able to mature in the absence, for once, of heavy stainer attack. Two of the new Barberton crosses, A.2120 (of the U.4/5143 × Cambodia group) and A.2195 (U.4/8161 × MU8A) were closely studied. They were included in three balanced, incomplete block trials of 25 strains × 6 replications, one on the Ukiriguru hill-sands, the other two scattered over district plots ranging from as far north as Ukerewe Island to as far south as Lubaga. The season proved to be one of fairly light jassid attack, so that the highly jassid-resistant types, such as A.2120 and MU8A were never fully extended. The results of the trials show that A.2120 and A.2195 put up a very creditable performance, and can be expected to do relatively better in a year of heavy jassid. A fault of A.2120 is its lateness, which may be serious in some years, especially in the south of the Province, where the season is often curtailed by stainer attack. A.2120 has vigour —very desirable on the played-out soils—large bolls, and seemingly good lint quality, in addition to its first-class jassid resistance. A.2195 is an earlier plant but less vigorous, and with jassid-resistance and lint quality somewhat below A.2120. There was little difference in yield between the Mz.561 and Mz.Local strains. In a trial on the heavy black bottom land (or "mbuga") at Ukiriguru Mz.561 and Local were yielding alike at 376 lb. lint per acre; MU8A in this trial was significantly heavier with the good yield of 493 lb. lint per acre, but this 30 per cent. increase is small in comparison with the increase over Mz.561 (50 per cent.) and over Local (100 per cent.), reported under last year's "mbuga" trial, when jassid damage was heavy. Several of Parnell's U.4 × Sea Island crosses were also grown in observation plots. On soil of mediocre fertility many of these "quality" crosses show insufficient hairiness for the conditions, but all are being carried forward again after mass selection. For general field qualities A.3313/1 appears the best of those tried. Vigour is rather lacking in the group as a whole; lint quality, however, is in a higher class than in the run of the material on Ukiriguru.

The chief pests encountered during the season were jassid, stainers, American bollworm, and *Lygus*, but, in general, attacks were not serious. Blackarm caused some damage to district cotton in the poorer soils around Ukiriguru, but was rare

on Lubaga. *Alternaria* was troublesome in patches on Lubaga, and one or two heavy attacks were experienced on district cotton in Shinyanga.

Eastern Province.—Weather conditions were unfavourable during the season, and in addition heavy attacks of American bollworm were experienced; this combination of circumstances resulted in the cotton crop being the lowest for many years. The testing of different varieties and strains, particularly with regard to their reaction to insect pest attack, was continued. The varieties used were the types forming the commercial crops of Buganda (B.P.52), the Lake Province of Tanganyika (Mz.561), Eastern Province Local, a Kingolwira selection (553), and M.U.8, a strain of Malwa Upland. The last was included again on account of its early maturity and prolific flowering. Planting everywhere was carried out at roughly the same time in randomized blocks with six replications; very good plant stands were obtained. With the exception of the trial carried out at Kingolwira Farm, M.U.8. maintained its leading position. One disappointing feature of the trial was the performance of the Uganda B.P.52, which yielded little more than Local. The high quality of the lint, however, was maintained. The quality of Mz.561 was not equal to that of Local.

The chief pests encountered during the season were jassid, American bollworm, pink bollworm, spiny bollworm, stainers, *Calidea, Helopeltis,* and *Lygus.* The major injury to cotton was caused by the American bollworm.

212. UGANDA. COTTON INDUSTRY, 1945-46. The report of the Dept. of Agriculture for January states that weather conditions were very hot and dry throughout the Protectorate, the dry season being more severe than usual. These conditions favoured picking and marketing, but unduly hastened the ripening of the crop and prevented the maturing of the top crop. To this crop reduction must be added the unusually heavy damage by blackarm disease, resulting in a still further reduction in the estimated bale output for the season.

213. COTTON INDUSTRY, 1945-46. (*Overseas Rev.*, Barclays Bank, April, 1946.) It is estimated that 80 to 90 per cent. of the Uganda crop has been marketed, and the unofficial estimate is now reduced to 200,000-220,000 bales.

214. COTTON CROP SALES. (*Crown Col.*, April, 1946, p. 284.) Negotiations for the sale to India of the balance of the 1945-46 Uganda cotton crop have been completed. The price fixed is Rs.850 per candy for B.P.52 in Kampala.

215. COFFEE AND COTTON FUNDS. (*Crown Col.*, April, 1946, p. 275.) The total sum in the hands of the Uganda Government from the coffee and cotton control funds was approximately £4,684,000 at the end of 1945. The method of disposal of the funds is being considered in conjunction with Uganda's development programme.

216. AUSTRALASIA. AUSTRALIAN COTTON INDUSTRY: DEVELOPMENT. By M. E. Wambsgauss. (*Text. Wkly*, **37**, 1946, p. 14. From *J. Text. Inst.*, xxxvii., **3**, 1946, A137.) A brief history of cotton growing in Australia, now confined to Queensland. Spinning and weaving commenced about twenty years ago and have made much progress during the war. In 1943 there were 71 factories, 36 in New South Wales, 31 in Victoria, 2 in South Australia, and 2 (ginneries) in Queensland. They employed some 7,940 workers, and the combined output was worth £7,964,911. The mills consumed in 1942-43 almost all of the Queensland crop, plus imported cotton, making in all about 60,000 bales. The weaving mills consumed nearly 19,500,000 lb. of yarn and 265,713 lb. of mercerized yarn. They produced 448,590 dozen towels, 145,059 sq. yds. of towelling, 1,109,213 of cotton tweed, 146,585 of denim, 4,063,238 of canvas, 3,157,859 of duck, 7,223,845 of drill, 3,501,786 of other piece-goods, and 1,569,571 of tyre-cord fabric, as well as unreported quantities of shirting, tape, etc.

217. QUEENSLAND: COTTON BREEDING WORK AT THE REGIONAL EXPERIMENTAL STATION, BILOELA, 1944-45. (*Prog. Rpts. from Exp. Stats.*, 1944-45.) Good progress was made in several directions in the cotton-breeding programme, both in regard to improving Miller and evolving jassid-resistant strains of this and other varieties. Further multiplication of the mass selection from Miller was achieved,

and a good foundation stock is available to replace the main commercial strain of this variety. Very encouraging results were also realized in the main progeny block of Miller, located on a farmer co-operator's property near the Experiment Station. Evidence was obtained that in this material there is a high degree of correlation between the performance of parent plants and subsequent progenies, particularly in regard to lint percentages. The outstanding progeny increase of this group yielded 38·4 per cent. lint compared with a mean of approximately 35 per cent. for the main commercial stock of this variety. The main jassid-resistant breeding programme was again handicapped by the absence of a severe attack by jassids. The conditions provided an excellent opportunity, however, to test the respective merits otherwise of the more advanced strains of Miller and hybrids between Miller and U.4 developed for jassid resistance. The results indicated that some very promising strains are now available. The highly resistant Miller strain III-26-0, which was released as Lot I, performed well under dry conditions, yielding approximately 200 lb. raw cotton per acre. This strain will accordingly be the main jassid-resistant cotton for releasing in areas where this type of Miller cotton is required. Newer, very promising jassid-resistant Miller strains are under investigation, however, which produce longer fibre and have a more open habit of growth, and one of these may eventually replace Lot I. Unfortunately, the results obtained from Umil 12—the first Miller × U.4 hybrid released for commercial testing—indicated that while this strain is undoubtedly a very high-yielding, quick-fruiting type, its lint percentage is substantially reduced by dry conditions. As re-selections with lint percentages up to 40 were obtained in the bulk stock of it, which only averaged 32 per cent. in commercial ginnings during the season, further testing of this hybrid will be discontinued until a superior strain from one of the new selections is available.

Although work in the main hybrid progeny plot was handicapped by lack of a severe jassid attack, it was possible to assess the progress that is being made, by applying the hair density test. A rigorous programme of rogueing all plants with less than medium hair density was carried out, and while some strains were entirely destroyed, a large number had less than 10 per cent. of their plants removed, with 16 strains suffering no loss, as every plant in them was densely hairy. No severe jassid attack being experienced by the end of the season, only strains with better than medium density of hairs were used for re-selection, a total of 70 being available with lint percentages ranging from 36 to 41, fibre length over $\frac{15}{16}$ inches and of satisfactory strength, and bolls of good size.

218. WEST INDIES. REPORT OF THE TENTH ORDINARY GENERAL MEETING OF THE WEST INDIAN SEA ISLAND COTTON ASSOCIATION (INCORPORATED). The report contains the minutes of the first Ordinary General Meeting of the newly registered Association in Antigua, held in June and August, 1945, but for convenience, and with the consent of the majority of members, it was decided to regard and number the meeting as the Tenth Ordinary General Meeting of the Association. The report also contains statistics and other memoranda relating to the British West Indian Sea Island cotton industry.

It was agreed at the meeting to recommend to member Associations that the export levy on all clean lint exported be increased to the rate of one cent. per pound, beginning with the 1945-46 crop, with a view to enlarging the fund for an advertising campaign. In order to maintain the quality of Sea Island cotton, the meeting decided it was essential that there should be uniform legislation throughout the cotton-growing islands in respect of the licensing of ginneries and the marking of bales. In regard to the question of the disinfection of ginneries, it was reported that arrangements were being made with the assistance and co-operation of Mr. L. G. Killby, of the Empire Cotton Growing Corporation, and the Entomological Department of the Imperial College of Tropical Agriculture, to conduct trials with the new insecticide DDT in the Government cotton ginnery in St. Vincent.

The President, in his address, referred to the outstanding importance of the work of the Advisory Committee in England during the year under review, and special

mention was made of the valuable memorandum on the subject of the future of the B.W.I. Sea Island cotton industry prepared by Dr. Tempany and Mr. Killby, with the assistance of information supplied by Mr. Chance and adopted by the Committee. The views of the Committee are summarized as follows: The position of St. Vincent Superfine (V.135) seems to be moderately assured within a limited market of 700 to 800 bales per annum; it is highly improbable that within these limits it will have to face competition from any other growth. It is accepted, however, that certain types of Egyptian cotton may possibly be serious competitors of the Montserrat Sea Island type (M.S.I.). Nevertheless, the Committee considers that the special characteristics of Sea Island cotton, which impart distinctive feel and quality to the fabrics made from it, will assist it to continue to hold its former place in the face of competition from the new Egyptian strains. The Committee regards it as essential, however, that the industry should make every effort to reduce the cost of production, and, with the aid of judicious advertisement, estimates that a market might be found for some 4,000 bales of M.S.I. per annum. In conclusion the Committee drew attention to the fact that, whereas adequate provision was being made for seed supply and pest control, yields were generally low, and intensive experimental work was needed to devise improved methods of cultivation as a means of obtaining higher yields.

The President stated that he had much pleasure in welcoming the appointment of Mr. J. V. Lochrie, O.B.E., formerly senior officer in Swaziland of the Empire Cotton Growing Corporation, as Cotton Officer in the West Indies. Mr. Lochrie succeeded Mr. J. B. Hutchinson, whose valuable services to the Sea Island cotton industry in the islands were greatly appreciated.

[*Cf.* Abstr. 61, Vol. XXII. of this Review.]

219. Antigua Cotton Industry, 1945-46. (*Overseas Rev.*, Barclays Bank, April, 1946.) Cotton is coming in faster than can be handled by the ginnery. This season the Ministry of Supply are not to purchase the crop as they have done in recent years, and to assist growers the Local Government has agreed to purchase clean seed cotton at 3d. per lb., which price is said to be below cost of production.

220. Barbados. Cotton Industry, 1944-45. (*Ann. Rpt. Dpt. Sci. and Agr.*, 1944-45. Received, 1946.) The rainfall distribution for the island as a whole was much more regular and satisfactory than in the previous season. 324 acres were planted to cotton—56 acres by plantations and 268 by peasants. The total yield of seed cotton amounted to 89,607 lb., made up of 26,335 lb. by plantation cotton and 63,273 lb. from peasants. The average yield per acre for all plantings was 276 lb. The ginning percentage for the island's crop, as recorded by the Barbados Co-operative Cotton Factory, was 25·9. Excellent results have been obtained in soil erosion control, and in order to encourage the laying out of contour drains by planters and peasants a striding level—strong, cheap, and easy to make—has been evolved, and has been used to lay out further demonstrations of contour work at Groves, St. George, and Blowers, St. James. For the sixth year in succession no pink bollworm (*Platyedra gossypiella*) was found. Attacks of *Alabama argillacea* reduced the yield of cotton when growers failed to spray with insecticides, but fair control was obtained in some cases by spraying the pest with lead arsenate.

In connection with Plant Disease Inspection, ten bales of stained cotton lint were examined, and as no pests of cotton were found, the bales were admitted for local consumption. No shipments of cotton seed arrived in the colony during the year, and the barge on which the Simon's heater was erected was dismantled. One shipment of cottonseed-meal was examined for the presence of Mexican boll-weevil, but none was found.

Cotton Research Work, 1944-45.—Work was continued during the season with selfed seed obtained from thirteen plants selected from the progeny plots during the 1943-44 season and the standard variety B.1. The selfed seed of the bulked cotton from 11 of the 13 selections of the 1943-44 plots was grown at Codrington

Experiment Station in a variety trial with B.1 as a standard. Five of these have been selected on yield of seed cotton per acre and ginning outturn, and will be grown in a further variety trial next season; they are B.4301, B.4306, B.4308, B.4309, and B. 4310. A second variety trial was conducted at Codrington which included selections of the "B.40," "B.41," and "B.42" series with B.1 as standard. Four of the varieties have been retained—viz., B.4001, B.4111, B.4204, and B.4212. These strains will be included in a variety trial next season with the selections of the "B.43" series and the standard B.1. A sample of lint of the island crop was sent to the Shirley Institute for a small-scale spinning test.

221. GRENADINES. MARIE GALANTE COTTON, 1944. (*Ann. Rpt. Agr. Dpt.*, 1944. Received, 1946.) The Marie Galante cotton crop amounted to 94,114 lb. seed cotton, compared with 147,939 lb. in 1943; this reduction was mainly due to a change in policy and cropping programme in Mayreau. The seed cotton was purchased by the Government Central Cotton Ginnery of St. Vincent and shipped for ginning to the newly-established Central Ginnery at Carriacou. The lint was exported to the United Kingdom at an agreed price of 9s. 5d. per lb. c.i.f.

222. ST. VINCENT SEA ISLAND COTTON INDUSTRY, 1944-45. (*Ann. Rpt. of Agr. Dpt.*, 1944. Received, 1946.) Of the total acreage planted to Sea Island cotton, 925 acres were sown by estates and 1,255 by smallholders. Germination of the seed was excellent and early growth was good, but high winds in November and subsequent heavy rains completely ruined crop prospects except in a few sheltered areas with late-planted fields. Yields were expected to be very low. Interest in the crop declined, owing to scarcity of labour and rising costs without a proportionate increase in price, and growers turned to more attractive alternative crops.

223. ST. VINCENT. COTTON EXPERIMENT STATION. (*Ann. Rpt. of Dpt. Agr.*, 1944. Received, 1946.) The station was closed down in 1944 following the decision of the Empire Cotton Growing Corporation to terminate its experimental work in the West Indies. The Corporation has for many years been associated with the cotton industry in the colony, having as far back as 1921 provided a Cotton Research Officer to conduct cotton breeding investigations in St. Vincent. The appointment was discontinued in 1926, but numerous complaints from buyers regarding the deterioration of the quality of St. Vincent cotton led to the re-establishment of the post by the Corporation in 1930, and a Research Officer was placed in charge of the Cotton Experiment Station provided by the local Government. As a result of the work of the station the quality of St. Vincent V.135 Superfine cotton has been so improved that little further can be done from the genetic point of view, and it is felt that the services of a full-time cotton breeder are no longer required. The St. Vincent cotton industry owes a great debt of gratitude to the Corporation for having accepted the responsibility for supervising this work, and the opportunity is taken to express the thanks of the industry to the Corporation for its assistance and generosity. Mr. H. L. Manning, who was appointed Cotton Research Officer in 1938, left the colony in July, 1945, to take a course in Experimental Statistics at North Carolina University before proceeding to one of the Corporation's cotton stations in Africa. During his stay in St. Vincent Mr. Manning threw himself whole-heartedly into the performance of his duties. He achieved much success in his efforts to improve cotton breeding methods by the application of the latest statistical technique, and made important contributions to the selection of improved strains of Superfine Sea Island cotton.

224. WORK OF THE COTTON EXPERIMENT STATION, 1943-44. By H. L. Manning. (*Ann. Rpt. of Dpt. Agr.*, 1944. Received, 1946.) In view of the relative genetic uniformity of the V.135 material, progenies of this variety were carried on in non-replicated rows for maintenance. The main trial comprised a 9 × 9 Lattice Square arrangement in which 73 VH and 3 RVH (Red VH) progenies were tested against representative progenies of V.135, M.S.I. and B.S.I. The genetic variability shown to exist in the VH breeding material indicated that profitable selection within this material was still possible, particularly in the case of the genotype known as VH 10,

which continues to segregate for the character, lint per seed. Several crosses have been made between VH progenies to increase the variability of the breeding material. The Lattice Square layout provided adjusted data which further enhanced the accuracy of the yield analyses made by the application of the method of multiple regression. These showed that the relative importance of various yield components was not the same for the two important genotypes VH 8 and VH 10, and indicated that the most profitable line for further selection might be for number of bolls in the case of the former, and for boll size in the case of the latter. A $3 \times 2 \times 2 \times 2$ experiment to investigate the differential varietal responses to the main fertilizer ingredients, N, P, and K, was carried out on truncated Yellow Earth soil at the Kingstown Experiment Station, the three varieties under observation being V.135, M.S.I., and VH 8. As was to be expected, aggregate yield responses and growth increments due to nitrogen exceeded those due to the other two fertilizers, which had only small and inconclusive effects. A significant V by N interaction due almost entirely to the M.S.I. variety was demonstrated, and this is construed as evidence that M.S.I. utilizes available nutrients, in particular nitrogen, with greater efficiency than do the other Sea Island varieties under trial—a hypothesis which explains the superior cropping ability of M.S.I. under low-fertility conditions. An experiment to determine the optimum time of application for artificial manures was partially invalidated by heavy and untimely rains. While the experiment yielded no conclusive evidence, there were, however, indications that the later applications (6 to 8 weeks after sowing) might favour increased numbers of seeds per boll.

225. THE PRODUCTION AND CHARACTERISTICS OF THE WORLD'S COTTON CROPS. (*Shirley Inst. Memoirs*, xix., 1945; xx., 1946.) "It is now felt that the time is opportune for presenting a general survey of the world's cotton crops, in a form such that details of their growth, characteristics, and production are available for reference. The spinner requires a knowledge of the characteristics and production of the various growths to enable him to choose those most suitable for a given purpose, and also to know which cottons may serve as alternative sources of supply when his accustomed variety is difficult to obtain, shows a change in quality, or disappears from the market. The survey is also intended for the use of cotton growers and breeders, who frequently only come into contact with the cottons grown in their own areas, and require information regarding the various types produced throughout the world. They need to compare the characteristics of their own crops, and of their experimental strains, with those grown elsewhere in order to gauge any progress being made."

The first paper of the series deals with the cottons grown in the West Indies, the second with those of Egypt.

Part I. *The West Indies.* By E. Lord.—When the New World was discovered by Columbus the natives in the West Indies were practised in the spinning and weaving of cotton. Recent work indicates that the main type then grown in the Caribbean region, including parts of the mainland, was the perennial type now known as Marie Galante, still grown commercially to a small extent, notably in the Grenadines. About the time of the American revolution most of the cotton entering England came from the British West Indies, and probably consisted of this and related types. The development of cotton-growing in the United States quickly reduced the British West Indian industry to insignificance, until it persisted only in the Grenadines.

Following the establishment of the Imperial Department of Agriculture to deal with the situation caused by the decline of the sugar industry, the Sea Island cotton industry was founded by the introduction in 1903 of several tons of seed of a type known as Rivers from South Carolina. By the year 1908 the crop reached the equivalent of about 5,000 bales of 500 lb. Some ten years later American production of Sea Island went into a rapid decline and left the West Indies with a practical monopoly. Unfortunately the demand for long fine cotton on the world's markets also declined, and except in the war period over-production became a serious problem which is likely to reassert itself.

At first cotton-growing was attempted in most of the Antillean islands, and especially those with extensive sugar estates. In the early years Barbados took a prominent part. In more recent years production on any considerable scale has become more restricted, and the types of Sea Island cotton grown have been reduced for practical purposes to two. The first of these is the St. Vincent Superfine, unique in the world for its combination of length and fineness. It is grown only in St. Vincent, and is the only cotton now grown there. The crop usually amounts to 800-1000 bales and meets the normal demand for cotton of this exceptional quality. The second is a type developed in Montserrat, and known as Montserrat Sea Island or M.S.I. This is more productive, and suits the requirements of spinners needing a cotton of somewhat lower quality and price than Superfine. Montserrat is the largest producer of this cotton, with St. Kitts normally second, but displaced from this position during the war years by its dependency Nevis. Agriculturally the St. Kitts crop is distinctive, being grown mainly as a catch crop on the sugar estates. In Nevis the industry is almost entirely in the hands of peasants. In Montserrat and St. Vincent the crop is grown partly by peasants and partly by estates on which cotton is the predominant interest. The system of seed supply for the two types is centralized in St. Vincent and Montserrat respectively, and is under effective control.

On the technological side the fibre characteristics and spinning value of the various types of West Indian cottons are discussed and set out in tabular form; the derivation of the varieties is traced. On the question of the competition threatened by the recent development of very fine-quality cottons in Egypt, it is considered that the stability now attained in the quality of the Sea Island crop, which contrasts favourably with past experience of Egyptian types, has earned the confidence of spinners and is a valuable asset favouring the West Indian industry.

COTTON IN THE UNITED STATES.

226. American Cotton Acreage, Season 1946-47. (*Cotton*, M/c., 6/4/46.) The goal for 1946 is stated by the U.S. Dept. of Agriculture to be 20·2 million acres. No difficulty should be experienced in reaching this goal, provided that more labour is available on cotton farms and that wage rates and prices of competing crops do not increase relative to cotton prices. Farmers need to make a considerable shift from short staple to somewhat longer staple varieties if the 1946 requirements in this direction are to be met. Further, in order to achieve the needed grade distribution more care will have to be used in harvesting than could be exercised during the war years. Very favourable weather in harvesting time will also be needed to secure the minimum desirable grades in the 1946 crop. In the coming years of peace, unless production is of better grades mills will be forced to adopt substitute qualities or even forced to use other fibres. With normal yields production on an acreage equal to the 1946 goal would amount to 10·9 million bales.

227. Supply and Distribution of American Upland Cotton in the United States. (*Cotton*, M/c., 19/1/46.) A table is given showing the stocks, production, and total supply for the 1944-45 and 1945-46 seasons of the various grades and staples and the degrees of tenderability of the American Upland cotton crop. The total production of Upland cotton is given as 11·83 million running bales in the 1944-45 season and 8·952 million running bales in the 1945-46 season.

228. The Packaging of American Cotton and Methods for Improvement. By J. W. Wright *et al.* (*U.S. Dpt. Agr. Circ.*, 736, 1945. From *Exp. Sta. Rec.*, **94**, 3, 1946, p. 384.) Present-day methods of packaging and handling American cotton result in a substantial economic loss each year, with accompanying adverse criticisms in the markets of the world. Prompted by this condition the Dept. of Agriculture undertook a comprehensive study of the problem designed to explore various alternative possibilities of packaging, which resulted in detailed information with respect to:—(1) Mechanical feasibility of gin compression; (2) costs of gin compression as compared with costs of low-density packaging and recompression; (3) effect

of gin compression on fibre quality and on acceptability of bales by cotton manufacturers; (4) adaptability of the package to transportation equipment and to the transportation freight-rate structure; and (5) suitability of the package from the standpoint of meeting trade, storage, and handling requirements. The standard-density gin press with three hydraulic rams and a 20 × 54-in. box designed to produce 500 lb. bales, was found to provide the method of packaging that would most nearly fulfil the needs of the American cotton industry and be economically adapted to existing gin installations. The authors discuss in detail the packaging of cotton at gins in bales of " standard density " and the economic feasibility of this method with its effect on the marketing system and on the processing by mills. The mechanical features and operation of presses employing the standard-density method of packaging were presented in Circular 753.

[*Cf.* Abstr. 179, Vol. XXIII. of this Review.]

229. American Cotton Mill: Modernization. By C. M. Bowden. (*Text. World*, **95.** 12, 1945, pp. 106, 190, 193. From *Summ. Curr. Lit.*, xxvi, **5**, 1946, p. 101.) An illustrated description is given of new machinery, improved plant layout, and better maintenance systems which are being introduced in several American cotton mills.

230. Increased Sales of Fertilizers to U.S. Cotton Farmers. (*Cotton*, M/c., 13/4/46.) It is reported that in nine of the U.S. cotton states, during the first seven months of this season—*i.e.*, August to February inclusive—sales of fertilizers amounted to 3,240,199 tons compared with 3,030,525 tons during the corresponding period last season. Crop experts have pointed out that the use of fertilizers during the past two years has been regarded as remarkably high, and this season's buying either indicates that the U.S. farmers are going to increase their cotton acreage or are going to use more fertilizer per acre.

231. Georgia: Cotton Variety Tests. (*57th Ann. Rpt. Ga. Exp. Sta.*, 1944-45. Received 1946.) Eleven varieties of cotton have been tested in north Georgia locations during the period 1942-44. Empire cotton has led all other varieties, both in acre yield of lint and in money value. Differences in acre value are relatively small, however, between the five leading varieties. Coker 100 Wilt is an excellent general purpose variety, as it produces well in south Georgia under wilt conditions and is also well adapted to north Georgia conditions. Fibre tests indicate that Coker 100 and Coker 100 Wilt produce fibre somewhat lower in tensile strength than Stoneville 2B and Empire. Coker Wilds ranks fourth in money value, due to present high premiums for long staple fibre. This variety is not adapted for production under average farm conditions, as special precautions are necessary in picking and ginning its type of fibre.

In three variety tests conducted in north Georgia in 1944 Empire strains led all other varieties. Coker 100 Wilt-4 ranked second in the north Georgia tests, largely as a result of exceptional performance under severe drought conditions in the Gordon County test, but this variety was less productive than Coker 100-8 at other locations. Auburn 061, a new strain developed at the Alabama Experiment Station, produced high yields at the Georgia Experiment Station and in Pike County, but failed to yield well in the Gordon County test. Bobshaw was less productive than most other varieties, but is outstanding with respect to tensile strength of fibre. Three years' average performance of cotton varieties planted in the Coastal Plain indicated that Coker 100 Wilt and Stonewilt were superior in most characters. Both varieties are early, wilt-resistant, and are widely adapted to Coastal Plain conditions. Coker 4 in 1 is a very resistant variety to wilt and root-knot, but due to the low percentage of lint it was somewhat less profitable.

232. Georgia: Empire Cotton. (*57th Ann. Rpt. Ga. Exp. Sta.*, 1944-45. Received 1946.) Due to favourable results obtained with Empire cotton in central and north Georgia, and at a number of locations in other states, farm production of this variety has increased rapidly during recent years. The total area was about 400 acres in 1943, 2,000 acres in 1944, and it is estimated that over 12,000 acres are being grown by farmers in 1945. Most of the increased interest in Empire has occurred in sections where farmers have grown the variety previously and have been favourably impressed

with its earliness, yielding ability, picking qualities, and high ginning outturn. Two communities in Georgia, totalling about 3,500 acres, organized for 100 per cent. planting of this variety in 1945, and several other communities are planning to replace present varieties with it in 1946. Numerous trial plantings of Empire cotton have been made in new areas, and these should be of considerable value in determining its adaptability to new areas and climatic conditions. In addition to increasing use of this cotton in the United States, limited amounts of seed have been requested for experimental purposes in Mexico, Brazil, India, and China.

Empire cotton has been tested with three popular commercial varieties, Stoneville 2B, Coker 100, and Deltapine 14, at state experiment stations in four states during three successive years. It produced the highest three-year average yield at Experiment, Georgia, and Knoxville, Tennessee. Coker 100 had the highest average yield at Auburn, Alabama, and Deltapine 14 averaged highest at Stoneville, Mississippi.

Experience obtained in Georgia during the past three years has indicated that trial plantings of Empire cotton under practical farm conditions are of use to farmers in evaluating the characteristics and performances of the variety in comparison with local varieties. All extensive areas of Empire production in the state have developed as a result of experience obtained with small, preliminary, trial plantings. The tendency toward increased utilization of this variety is illustrated by results in the Haralson One-Variety Community in Coweta County. In 1943, 12 acres of Empire were grown, about 325 in 1944, and over 2,000 acres in 1945. Similar increases in acreage have occurred in the Culloden One-Variety Community in Monroe County, which expanded from an area of about 20 acres in 1943 to 100 per cent. production in 1945.

In order to maintain a source of pure seed to establish new one-variety communities and for replacement purposes in present communities organized for the production of Empire cotton, a seed-producing programme has been established in co-operation with the Haralson Empire Seed-Producing Community, which will supply annually about 400 tons of breeders' seed. Experience has shown that organized communities can be maintained on a pure seed basis by planting 10 per cent. of the community acreage with breeder seed annually. On the basis of 10 per cent. replacement annually, the breeding programme at the Georgia Experiment Station is adequate to maintain over 3,000,000 acres of Empire cotton under organized one-variety conditions of production.

233. WILT-RESISTANT STRAINS OF EMPIRE COTTON. (*57th Ann. Rpt. Ga. Exp. Sta.*, 1944-45. Received, 1946.) Evidence obtained in 1944 indicated that some strains of Empire may be highly resistant to cotton wilt. Preliminary data obtained in 1945 confirm the results of the 1944 test. In a test conducted under severe wilt conditions at Plains, Georgia, 23 strains of Empire were tested in comparison with Coker 100 Wilt-4 as a resistant check, and Deltapine 14 as a susceptible check. Seven Empire strains had equal or greater resistance to wilt than the Coker 100 Wilt check rows. The most resistant strain of Empire had 6 wilted plants on June 27, as compared with 11 wilted plants in an equal area of Coker 100 Wilt and 218 wilted plants in Deltapine 14. This strain also showed the lowest wilt infection in the 1944 test, averaging 2 per cent. of infected plants as compared with over 40 per cent. infection in Deltapine 14.

234. GEORGIA: BREEDING COTTON FOR WILT RESISTANCE. See Abstract 314.

235. GEORGIA: COTTON SEED TREATMENT STUDIES. See Abstract 269.

236. COTTON DEFOLIATION STUDIES IN GEORGIA. (*57th Ann. Rpt. Ga. Agr. Exp. Sta.*, 1944-45.) Cotton defoliation studies were made in anticipation of the use of mechanical cotton pickers. Defoliation may also be useful where cotton has made excessive growth, to facilitate hand picking and reduce boll rots. The material for defoliation is finely-ground calcium cyanamide. It is primarily used as a source of nitrogen fertilizer and has 21 per cent. nitrogen. Application is made with cotton dusters at the rate of 30 lb. per acre; heavier applications cause the leaves to die quickly and remain on the plant. The optimum condition for application is when the plants are well covered with dew or when dews occur nightly. Re-

application may be necessary if rain occurs within 24 hours. Studies at Plains showed that within 24 hours leaves were burned over most of the surface of the plant and were beginning to fall, and within 48 hours 20 per cent. of the leaves had fallen. Complete defoliation occurred within a few days, resulting in a more rapid drying and opening of the green bolls. To avoid weakening of the fibre and reduction in yield, the latest bolls should be approximately 30 days old or fully grown in size. Plants in a vigorous growing condition will put out a new set of leaves; consequently defoliation should precede picking only 10 to 14 days.

237. MISSISSIPPI. MECHANIZATION OF THE COTTON HARVEST. By F. J. Welch and D. G. Miley. (*Miss. Sta. Bull.* 420, 1945. From *Exp. Sta. Rec.*, **94**, 2, 1946, p. 268.) The inefficiencies in cotton production and the need of reduced production costs are discussed. Using data for 2,229 bales of cotton picked in the Delta area with 12 picker-type mechanical pickers in 1944, analysis is made of the cost per bale, effect on grade and quality, and the amount of cotton left in the field with mechanical pickers, as compared with hand picking. In the Delta area, 65 per cent. of the total labour for cotton is required for harvesting. The machines picked an average of 4·3 bales per 10-hour day. The machine-picked cotton averaged 1·4 grades lower than the hand-picked cotton on the same plantations. Preliminary tests showed machine-picked cotton to have slightly superior spinning quality. The percentage of cotton left in the field was 9 per cent. with the mechanical pickers as compared with 2 per cent. with hand picking. The cost per bale for hand picking was $37.76; for machine picking the cost of picking was $7.38 per bale, loss in grade, $18.40, and loss of cotton (left in the field) $7.62, making a total cost of $33.40.

238. NORTH CAROLINA. EFFECT OF SALT INDEX, ANALYSIS, RATE, AND PLACEMENT OF FERTILIZER ON COTTON. By J. J. Skinner, *et al.* See Abstract 265.

239. OKLAHOMA. MECHANICAL HARVESTING OF COTTON. By H. Dunlavy and I. M. Parrott. (*Oklahoma Sta. Bull.* 286, 1945. From *Exp. Sta. Rec.*, **94**, 1, 1946, p. 118.) The authors give the results of a limited study of mechanical harvesting of cotton in which six comparative lots of hand and mechanically harvested cotton were analyzed. Calculations of field data to determine the difference in value of the hand and mechanically harvested bales after deduction of the cost of picking and ginning are presented in tabular form. From these tests indications were that: (1) As an average the machine-harvested required 145 lb. less burr cotton to make a bale than did the hand-harvested, and lint outturn was as high or higher in five of the six lots; (2) average grades of hand-harvested and mechanical-harvested cotton were practically the same; (3) harvesting costs per bale were $24.82 less by machine than by hand; hand-harvesting costs represented 41·3 per cent. of the gross value of the cotton, while machine-harvested was only 7·4 per cent.; and (4) the gross value of the bales from the two methods of harvesting was approximately the same because of no material differences in grades; however, machine-harvested bales gave 73·5 per cent. greater net value than the hand-harvested bales, or an additional money value of $26.02. An analytical report is also given of the results of a demonstration of mechanical harvesting as compared with hand harvesting, held near Anadarko, Oklahoma. In this demonstration the following machines were used: (1) John Deere stripper without extractor, (2) modified Texas type (Cohea) machine with extractor, (3) Allis-Chalmers converted grain combine, and (4) low drum International picker.

240. TEXAS. LEGUMES INCREASE THE YIELD OF COTTON AND CORN. (*57th Ann. Rpt. Texas Agr. Exp. Sta.*, 1944. Received, 1946.) The growing of adapted legumes in cropping systems has greatly increased the yields of cotton and corn on the sandy soils in eastern Texas and in the Blackland belt. On the sandy soils the results show that superphosphate must be used with the legumes to obtain the best results. On Lufkin fine sandy loam at College Station, the ploughing under of vetch fertilized with superphosphate and potash increased the yield of cotton about 40 per cent., and unfertilized vetch increased the yield only 6 per cent. during the eight years 1937-44. At Nacogdoches, cotton after vetch fertilized with superphosphate and potash made an average yield of 286 pounds of lint per

acre during the four years 1941-44, which was 75 per cent. more than the yield of 163 lb. of cotton which received no treatment. On the other hand, the ploughing under of unfertilized vetch increased the yields of cotton only 40 per cent. In a two-year rotation of cotton and corn at Tyler, in which vetch was planted as a winter green-manure crop after corn, cotton following vetch fertilized with superphosphate and potash produced about 80 per cent. more lint per acre than untreated cotton after corn. The second year, corn following cotton on vetch land produced 27·7 bushels per acre, or twice as much as untreated corn after cotton. At Denton, in North Texas, the ploughing under of fall-planted legumes in early spring gave good increases in the yield of cotton in favourable years, as in 1943, but over a period of years the practice has not been profitable. The winter legumes, such as bur clover, hairy vetch, and Austrian winter peas, usually do not make sufficient growth early enough to prepare a good seed-bed for an early planted spring crop of cotton or corn. The over-seeding of sweet clover in the spring on small grain, in rotation with cotton and corn, however, has given good results. At Temple, in the Blackland Prairie, cotton in a two-year rotation with Hubam clover (harvested for seed) produced an average yield of 315 lb. of lint per acre during the five years 1940-44, while continuous cotton produced only 165 lb.

COTTON IN EGYPT.

241. EGYPT. COTTON INDUSTRY, 1946. (*Overseas Rev.*, Barclays Bank. April, 1946.) The activity noticeable during February continued for the first half of March, but there has been a noticeable slackening off recently. The French spinners bought about 15,000 bales, but have not been on the market for a few weeks; it is generally believed, however, that they will recommence buying as soon as they have been able to make the necessary financial arrangements, over which some difficulties had arisen. Considerable quantities of cotton have been shipped to Italy; some of this was financed through England, other shipments were the outcome of barter business from Egypt, and others, again, were arranged against shipment of textiles and luxury goods to Syria. Cotton has also been sold to Sweden, U.S.A., Denmark, Greece, Norway, Finland, and other countries. The British Ministry of Supply has not made any purchases. New-crop cotton is being steadily delivered to the Government of Lower Egypt—only about 60,000 bales remain to be tendered; there are considerable quantities left of short-stapled Upper Egypt cotton, for which there is a relatively steady demand on the market at prices ranging from $1½ to $2 over the Government prices. There has been a regular, if quiet, enquiry for the top grades of old-crop Karnak, with prices tending to harden, and there do not appear to be very liberal supplies available of these grades. There has also been an occasional enquiry for the medium grades of Karnak, with prices unchanged from last month. Short-stapled old crop has been in request, but the demand has not been nearly so keen during the past fortnight, and values have fallen away slightly. Medium staples have been neglected.

Planting is now general all over Egypt for the next crop, but acreage figures are not yet available.

242. COTTON CROP, 1946-47. (*Cotton*, M/c. 27/4/46.) A report from the Alexandria Commercial Co., dated April 15, states that owing to the low temperatures ruling at night and the recent variable state of the weather, the climatic conditions for the growing crop have been distinctly unfavourable. All sowing may now be considered as completed, but the development of the young plants is being considerably retarded. Complaints of irregular water supply are being reported from many parts of the Delta, and it is rumoured that water may be scanty during the coming summer months.

243. THE PRODUCTION AND CHARACTERISTICS OF THE WORLD'S COTTON CROPS. (*Shirley Inst. Memoirs*, xx., 1946.) Part II. EGYPT. By E. Lord. In contrast with American cotton the production of Egyptian cotton is almost entirely confined

to Egypt itself. The exceptions are the Sudan and Peru as exporting countries, and the Soviet Union and the United States for local consumption. Primarily useful for fine cotton materials, Egyptian cotton is valuable also for heavy materials requiring great strength and resiliency. The modern history of cotton cultivation in Egypt dates from 1820, beginning with the development of the Jumel variety from an importation from the Sudan of a plant coming under the general species *G. barbadense* as now understood. Production reached 148,000 bales of 219 lb. in 1824. In the succeeding decades many American types were introduced and much mixing of stocks took place. The first recognized variety to emerge from the medley was Ashmouni, which appeared about 1860. This soon rose to predominance, and is still one of the largest crops. Somewhat later a large number of other varieties emerged. An attempt is made by the author to trace the descent of all the varieties in cultivation at the present time. Notes concerning the most important types are given in approximate chronological order.

A section deals with Diseases and Insect Pests. Cotton wilt and soreshin are the outstanding diseases; cotton leafworm (*Prodenia*) and the pink and spiny bollworms the most important insects. Another section gives an account of the three major institutions dealing with research: the Cotton Research Board, founded by the Ministry of Agriculture, the State Domains Administration and the Royal Agricultural Society. The official methods of seed selection and supply are described, and the subject of degeneration, which has long been a problem of particular interest in Egypt, is considered. The system of grading is explained. Under the heading Characteristics and Production an account is given of the fibre and yarn characteristics of the varieties now forming the main Egyptian crops, based primarily on tests made at the Shirley Institute. The cotton now known as Amon (Giza 39) is the best ever produced in Egypt on a commercial scale. The first appreciable crop was 200 bales in 1942-43, rising to about 1,000 in 1943-44. Amon is appreciably shorter than ordinary West Indian Sea Island (M.S.I.) but has a much finer fibre and gives yarns appreciably stronger. The yield is poor for Egypt, but almost double that of Sea Island. Karnak is a highly successful cotton developed by the Ministry of Agriculture, and has displaced the surviving portions of several earlier introductions, including Sakel. Its expansion has been phenomenal, from 1,250 bales in 1939-40 to 440,000 in 1943-44. Particulars are also given of new varieties on trial and of varieties still available in the carry-over. Finally, the future development of the Egyptian crop in relation to the prospects of the varieties now available is considered. The main question is whether the demand for high-quality cottons which has existed for purposes connected with war will continue at anything like the same level in times of peace.

COTTON IN OTHER FOREIGN COUNTRIES.

244. Argentina. Boletin Mensual. (*Min. de Agr., Direcc. de Algodon*, Buenos Aires, Argentina, 1944. Received, 1945.) *Bulletins, Nos.* 111-115, contain the following among other papers in Spanish: "The cultivation of cotton in Corrientes" (by A. F. Bravo); "Activity of cotton spinning mills in Argentina in 1943, and the consumption of raw cotton" (by M. Celli and J. P. Gonzalez); "Cotton Decree of September 5, 1944, No. 24.046/944," gives rules and regulations for improving all sections of the cotton industry in Argentina; "Anthracnose of cotton" (by M. A. di Fonzo). Statistics are also included of acreage, production, prices, exports, etc.

245. Une Contribution a L'Étude Morphologique des Cotonniers du Congo Belge. By R. De Poerck. (*Comm. de L'Ineac.*, **1**, 1943. Received, 1945.) An examination of the morphological characters which permit a rapid identification in the field of the strains of cotton 15.P.4, 270.D.64, Stoneville, and 145.C.55. The results are shown by means of tables.

246. Brazil. Cotton Textile Exports Suspended. (*Cotton*, M/c, 13/4/46.) The Textile Executive Committee passed a resolution early in March suspending,

during a period of 90 days, the export from Brazil of cotton textiles and articles manufactured with such textiles. This suspension came into force as from March 14. The reason for adopting the measure is stated to be the necessity of obtaining an immediate increase in offers of cotton textiles to internal markets, and of preventing the export of cotton textiles from depriving domestic consumers of supplies. The period of 90 days will be automatically renewed for similar periods until such time as internal requirements are met. When exports are eventually resumed they will be subject to quotas, which will be allocated to the various manufacturers by the Textile Executive Committee, such quotas to be limited to 20 per cent. of the production of each mill and to be subject to proof that the remaining 80 per cent. has been delivered to the domestic market. Supplies of cotton goods to UNRRA and the French Government, in accordance with existing agreements, will not be suspended, but will be included within the limit of 20 per cent. fixed for export.

247. São Paulo Cotton. (*Cotton*, M/c, 13/4/46.) Reports from São Paulo dated March 15 state that the price of São Paulo type 5 cotton has again advanced during the past three weeks from Cr.$108 to Cr.$109 per 15 kilos, which compares with Cr.$81.50 twelve months ago. The Minister of Finance stated recently that in future years different measures would have to be adopted in Brazil in the matter of financing cotton. Financing with the option to sell to the Bank of Brazil would not be repeated. In normal times, he stated, the Government could not take the risk of being left with the entire crop. Financing would be on a percentage basis, taking the value of the cotton at the time the holder seeks official assistance.

According to the annual report of the São Paulo Produce Exchange the whole of the 1945 cotton crop in the state was of 28-30 mm. staple. Thus, although there has been a considerable fluctuating difference in the quality of the crops—with that of last year one of the worst for some time—the average length of fibre has revealed hardly any change during the past twelve years, a very different state of affairs from that which prevailed during the previous similar period, when the average length of staple rose from 22-24 mm. to its present average of 28-30mm.

248. Dutch Cotton Industry: History. By L. A. Driessen. (*Ciba Review*, **48**, 1944, p. 1748. From *Summ. Curr. Lit.*, xxvi., **5**, 1946, p. 105.) An historical account is given of calico printing and cotton weaving in Holland from the seventeenth to the nineteenth century.

249. Les Récherches Cotonnières en Afrique du Nord. By E. Miège. See Abstract 307.

250. A Brief Review of the Polish Textile Industry. By L. G. Manitius. (*J. Text. Inst.*, xxxvi., **10**, 1945, p. 158.) Briefly describes the origins of the textile industry in Poland. Figures are given for the extent of the textile industry before the war of 1914-18, and for the various branches of the industry prior to 1939. A brief review is also included of the methods applied in cotton mills in the country for singeing, bleaching, mercerizing, dyeing, and printing.

251. Russia. New Varieties of Cotton. (*Socialist. Zemledelie*, **122**, p. 2. U.S.S.R., 1944. From *Pl. Bre. Abs.*, xv., **4**, 1945, p. 356.) Tests under commercial conditions on the collective farms of the Murgal Oasis in Central Asia have been carried out on new varieties of long-fibred cotton bred at the Turkmen Cotton-Lucerne Experimental Station. The new varieties are of high quality and yield 200 per cent. more fibre than the cotton cultivated at present on the collective farms of the Mari Province.

252. Tadjikistan's Textile Industry during the Fourth Five-year Plan. (*Cotton*, M/c, 2/3/46.) Tadjikistan, one of the Central Asian Republics of the Soviet Union, has extensive plans for developing its economy, and particularly its most important industry, textiles. By means of large irrigation schemes it has been converted into a centre for the production of long-staple cotton. New varieties of Soviet cotton cultivated here are stated to be not inferior to the finest Egyptian varieties.

253. Irrigation of Uzbek Cotton Areas. By H. Jaffe. (*Cotton*, M/c,

6/4/46.) A discussion of the construction and working of the large pumping stations in the Uzbek Republic whereby the waters of the Syr Darya River are utilized for industry and agriculture.

254: YUGOSLAVIA. COTTON INDUSTRY. (*The Ambassador*, **4**, 1946, p. 118.) Before the war this was by far the most important textile industry of the country; it supplied about 50 per cent. of the cotton-textile needs of the Yugoslavs in the form of plain calico fabrics, sheetings, and coarse shirtings. The industry imported 90 per cent. of its raw materials, and to remedy this the Government had planned to raise the cotton acreage to 35,000, with an anticipated yield of 5,000 tons. Yarns spun in domestic mills supplied about 45 per cent. of home needs, and every endeavour was being made to increase this output by 100 per cent. A survey in the summer of 1945 estimated that spinning facilities were then 60 per cent. intact, with only 22 per cent. (about 175,000 spindles) completely destroyed. Some 232,000 spindles and 20,000 looms (including silk looms) were said to be available for production. By the end of the year about 80,000 bales of cotton had been shipped to Yugoslavia by UNRRA. In order to restore production to the pre-war level a considerable increase in imports of raw material is necessary; expansion beyond this point must await the replacement of obsolete equipment by modern machinery, and the training of additional technicians and workmen.

SOILS, SOIL EROSION, AND FERTILIZERS.

255. THE IMPROVEMENT OF SOIL FERTILITY. PART I. GENERAL CONSIDERATIONS. By H. L. Richardson. (*Emp. J. Exp. Agr.*, xiv., **54**, 1946, p. 100.) Most agricultural systems in the world are maintaining soil fertility at a low to moderate level only; under some of them there is, in fact, a progressive loss of fertility as a result of soil exhaustion or erosion. On the other hand, modern intensive agriculture has proved capable of raising average crop yields to a level from two to four times those of the traditional or extensive systems; and it maintains the fertility of the soil at this higher level. At first glance, therefore, it might not seem too difficult to secure the increased crop production that the world needs by applying modern intensive methods more widely than at present.

In addition to mechanical improvements the methods of modern intensive agriculture include crop rotation, improved crop varieties, control of weeds, pests, and diseases, also two matters of especial importance for maintaining soil fertility: (1) Combining arable cropping with the use of livestock, as in mixed farming, or alternate husbandry; (2) using inorganic fertilizers to supply soil deficiencies and to supplement local organic manures. Although many of the technical details are modern, the broad principles are old and well tested by experience. Even inorganic fertilizers have been in continuous use for over a century. It is the wider application of these methods that is lacking. Not only does a system of agriculture based on the foregoing principles best maintain soil fertility, and thus give the greatest production of crops over a long period, but it also leads to the production of a well-balanced human dietary, rich in protective foods; and it gives a system of farming which can provide a high standard of living for those on the land. The problem of extending the methods of modern intensive agriculture to the rest of the world is, however, not a simple one. There are human difficulties, depending on habit or tradition, and on poverty, ignorance, and lack of health and energy. There are also natural difficulties: the methods of modern intensive agriculture were first worked out in humid temperate regions, and it is as yet uncertain to what extent they can be applied in other parts of the world. The present paper is particularly concerned with examining the extent to which these principal methods of fertility maintenance can be applied in different environments.

256. EQUIPMENT FOR FACILITATING MECHANICAL ANALYSIS OF SOILS. By E. P. Perry. (*Soil Sci. Amer. Proc.*, **8**, 1943, p. 372. From *Exp. Sta. Rec.*, **94**, 3, 1946, p. 304.) A rack and equipment for washing soil samples after their treatment with hydrogen peroxide and hydrochloric acid is described, together with a stirrer

found to be efficient for dispersing samples for pipette analysis. Details of construction of both pieces of apparatus are discussed and illustrated in drawings.

257. Soil Microbiology as a Field of Science. By S. A. Waksman. (*Trop. Agr.*, xxiii., **2**, 1946, p. 31.) The subject is discussed under the headings of: The Soil Microbiologist, and Soil Microbiology and other Sciences. The author states that it can now be definitely recognized that the soil microbiologist is in a position to make important contributions not only to our knowledge of soil processes and plant growth, but also to microbiology, especially microbial physiology, and to the utilization of micro-organisms for various industrial, public health, and other processes. The soil microbiologist is able to contribute in many ways to man's capacity to survive, by learning to control the activities of injurious micro-organisms and by favouring the processes brought about by the beneficial organisms. The reason why the broader concept "microbiology" rather than the narrower term "bacteriology" has been used throughout this discussion is that the soil microbiologist has often to pay as much attention to the fungi as to the bacteria, and occasionally also to the protozoa, the algæ, and even the nematodes and other worms, inhabiting the soil in large numbers. Only a recognition of all these lower forms of life and their many inter-relationships can help to elucidate this complex and important science.

258. The Measurement of Soil Water. By C. S. Scofield. (*J. Agr. Res.*, **71**, 9, 1945, p. 375.) Discusses the three methods in general use for measuring the quantity of water in the soil at any given time: (1) The gravimetric method, in which soil samples are weighed and dried to constant weight and from the loss of weight the water content is computed; (2) an electrometric method, involving the measurement of the electrical resistance between two electrodes embedded in a block of gypsum placed in the soil; and (3) the tensiometric method, which involves the measurement, with a mercury manometer, of the tension existing between the soil and its water. Detailed reports of tensiometric observations at a number of field locations with a number of different crops, including alfalfa, cotton, sugar beet, and potato, are presented. It was found possible to establish an acceptable relation between the data of tensiometric observations at any given field location and the quantity of available soil water at that location. This finding makes it possible to make up, for the soil of any given field location, a conversion table by the use of which the data of tensiometric field observations may be translated into (1) equivalent gravimetric percentages of available soil water, (2) equivalent volumetric percentages of available soil water, or (3) equivalent gravimetric or volumetric percentages of total soil water. Several methods of procedure to this end have been explored, and three of the methods are described.

259. Conservation of Water for Storage Underground. By F. Grundy. (*E. Afr. Agr. Jour.*, xi., **3**, 1946, p. 139.) The subject is discussed under the following headings: Conservation of flood water by construction of dams; Underground reservoirs; Disposal of rain falling on a catchment area—interception by vegetation, evaporation from the ground surface, transpiration by vegetation including water used in building plant tissue, percolation to the ground water reserve, and surface run-off; Consumptive use of water by vegetation; Soil moisture and the soil reservoir; Amount of water in the soil reservoir; The improvement of ground water supplies; Evaporation and precipitation; Grass as a cover to a catchment area; Catchment areas bare of vegetation.

260. Afrique, Terre qui Meurt. La Dégradation des Sols Africains sous l'Influence de la Colonization. By J. P. Harroy. (*Off. Int. de Librairie, Bruxelles*, 1944. 250 Belgian francs. 30s. From *Nature*, 30/3/46, p. 389.) M. Harroy has attempted to relate the whole story of soil deterioration and erosion in Africa as it has been described in the very extensive literature on the subject. Naturally, special attention is paid to the Belgian Congo, of which the author had personal acquaintance before the war, but adequate attention is given to British and French territories as well. Indeed, very generous recognition is given to British work on both physical and social problems of soil conservation. The book is a comprehensive and well-balanced summary of one of the most urgent questions

which confront all the Colonial Powers in Africa. The first four chapters deal with the nature and factors of soil formation, especially under tropical conditions. . . After describing the principal phenomena of land degradation—destruction of the natural vegetation, increasing floods and desiccation, and accelerated erosion—short accounts are given of the erosion conditions in the different African territories. In the next part of the book the author describes the transformation effected by European colonization in native society—religion, clothing, diet, education, health, etc.—but he does not always make clear the connection between these several phenomena and the incidence of soil erosion; indeed, in some of his discussions neither the land nor erosion is mentioned. He recognizes, however, that the restoration of soil fertility is essentially a problem in human ecology. Erosion is checked by direct measures on the soil—remedies of the first degree—such as afforestation, controlled grazing, irrigation, terracing, and so forth. These lead to remedies of the second degree—overall improvements in agriculture and radical modification of farming systems—that in turn lead to remedies of the third degree—the planned transformation of social conditions so that the second degree remedies will work effectively. The bases of all soil conservation must be knowledge acquired through research and imparted through education of the masses, and co-operation at all levels, among farmers, tribes, specialists, and even the metropolitan States. A plea is made for international action, at least between the three principal Colonial Powers in Africa.

261. SOIL CONSERVATION AND EROSION PREVENTION. By R. E. Haseler. (*Queensland Agr. J.*, **62**, 2, 1946, p. 69.) Deals with the subject under the headings of: Vegetative cover; renovation of farm lands; prevention of rapid run-off; soil conservation; terracing; spacing of terraces; crop planting.

262. SOUTH AFRICA: EROSION AND SOIL CONSERVATION. By J. P. van Aartsen. See Abstract 203.

263. SUDAN GEZIRA SOIL: NITRIFICATION. By T. N. Jewitt. See Abstract 208.

264. THE DIFFERENT METHODS, PARTICULARLY MICROBIOLOGICAL, EMPLOYED IN DETERMINING SOIL REQUIREMENTS IN FERTILIZER ELEMENTS. By G. Stampa. (*Int. Rev. of Agr.*, xxxv, 7 and **8**, Rome, 1944, 117T.) The following conclusions are presented:—It is considered that the best methods for determining the fertilizer requirements of soil are: among the physiological methods, the mathematico-physiological method of Mitscherlich, the " triple analysis " method of Lundegardh, and the Neubauer method; among the microbiological methods, those employing *Azotobacter*, *Aspergillus niger*, and certain *Cunninghamella*.

265. EFFECT OF SALT INDEX, ANALYSIS, RATE, AND PLACEMENT OF FERTILIZER ON COTTON. By J. J. Skinner *et al.* (*J. Amer. Soc. Agron.*, **37**. 9, 1945, p. 677. From *Exp. Sta. Rec.*, **94**, 2, 1946, p. 190.) Effects of salt index, analysis, rate of application, and placement of fertilizer on soluble salts in the soil of the cotton root zone and in the plant, on plant emergence, and on final yields were determined in a series of field tests at Rocky Mount, North Carolina, 1941-44. The fertilizers used were a 6-8-4 (6-8-8 in 1943 and 1944) low and high salt index applied at 400 and 700 lb. per acre, and a 9-12-6 (9-12-12 in 1943 and 1944), low and high salt index, applied at the equivalent rates of 267 and 467 lb. per acre. In 1941-42 the fertilizer was placed in the furrow at planting with the seed located 2·5-3 in. above the fertilizer band; in 1943-44 the fertilizer was also placed in bands 3 in. to the side. High salt index fertilizers regardless of analysis gave a higher amount of soluble salts in the root zone soil than did the low salt index fertilizers, although side-band placement, as compared with under-seed placement, markedly decreased the soluble salts in the root zone. A high rate of fertilizer application increased soluble salts to some extent. The high salt index fertilizers, the low analysis fertilizers, the 700-lb. rate, and the under-seed placement all tended to increase the soluble salt content in the plant. Correlation between soluble salts in the plant and in the root zone soil was only fair. Plant emergence was retarded and imperfect stands resulted from the use of high index fertilizers. Fertilizers of the same salt index had about the same effect on emergence and stand when used to supply equal amounts of N, P, and K. Side-band placement

improved stands more than low index fertilizers. The high salt index fertilizer reduced the yield only in 1941, when high analysis fertilizers increased the yield. Side-band placement of the fertilizer as compared to under-seed placement markedly increased yields. The 700-lb. rate of fertilizer tended to reduce yields with under-seed placement, but in 1944, under favourable conditions, the 700-lb. rate with side-band placement gave higher yields than the 400-lb. rate. Potential fertilizer salt injury to cotton may be avoided by using high analysis fertilizers with a low salt index and by placing the fertilizer in side bands. Yields will be lower if the fertilizer injury is severe enough to result in retarded plant development and in imperfect stands after chopping. Under a given set of environmental conditions the yield is the integrated product of the fertilizer effects.

266. Boron in Plant Life. A Brief Historical Survey. By J. W. Shive. (*Soil Sci.*, lx., **1**, 1945, p. 41. From *Rev. App. Mycol.*, xxv., **3**, 1946, p. 140.) The rôle of boron in plant economy is reviewed in the light of contemporary studies under the headings of: Discovery and distribution of boron in plants and soils; boron as a toxic and as a stimulating agent; indispensability of boron for plants; nature of boron-deficiency effects; and relation of boron to other elements in nutrition of plants. The bibliography comprises 46 titles.

STATISTICAL TREATMENT, CULTIVATION, GINNING, USE OF SEED.

267. Bias in the Use of Small-Size Plots in Sample Surveys for Yield. By P. V. Sukhatme. (*Nature*, 11/5/46, p. 630.) Sample surveys for yield of cotton, wheat, and paddy conducted in recent years all over India (except Bengal) have been carried out on plots of large size varying from $\frac{1}{160}$ to $\frac{1}{20}$ of an acre. In contrast, the plot size used in Britain and the United States is small, of the order of $\frac{1}{4000}$ of an acre. In India the small-size plot (area 13·6 sq. ft.) was first used by Hubback and in recent years by Mahalanobis. An investigation was carried out in the Moradabad district (area 2,288 sq. miles) for comparing different size plots. The plan of sampling was similar to that used earlier, except that in each selected field eight plots were marked at random: (*a*) two equilateral triangular plots of side 33 ft. subdivided into three strips by means of lines parallel to the base at distances of $8\frac{1}{4}$ ft. and $16\frac{1}{2}$ ft. from the vertex along the sides; (*b*) three circular plots of radius 2 ft. each; and (*c*) three circular plots of radius 3 ft. each. The triangular plots were marked with the help of chains and pegs and the circular ones with the help of a specially devised apparatus consisting of a peg, a steel tape, and a plumb line. The investigation was carried out by the staff of the Dept. of Inland Revenue posted in the district, who ordinarily are required to carry out these experiments under official orders. The results of the investigation are tabulated, and show that small plots (less than 30 sq. ft.) result in a serious over-estimation of yield. The bias diminishes with increase in the size of plot, but even plots of 118 sq. ft. are not free from bias. The differences in the yield estimates are found to be statistically significant. . . . The reason for over-estimation appears to be the human tendency to include border plants inside the plot. This factor becomes serious when the perimeter of the plot is large in proportion to its area.

268. Standard-Density Cotton-Gin Presses. By C. A. Bennett *et al.* (*U.S.D.A. Circ.* 733, 1945. From *Exp. Sta. Rec.*, **94**, 1, 1946, p. 118.) A presentation of information developed through tests made on uppressing presses concerning (1) the engineering problems involved in producing higher density bales at cotton gins without a broad departure from existing conditions and equipment or great expense for new machinery, and (2) the mechanical elements of cotton-gin press construction to meet bale packaging requirements for standard-density domestic shipment and consumption and to permit satisfactory recompression of bales to high density for export. The general requirements and specifications for standard-density gin presses with their auxiliary equipment are given, together with a discussion of field conversion of low-density gin presses for standard-density service. The

authors state that although the information presented was developed through tests made on uppressing presses, which represented 11,522, or 88 per cent. of the gin presses in the United States in 1940, the findings should also be applicable to the 12 per cent. of downpressing presses.

269. Georgia: Cotton Seed Treatment Studies. (*57th Ann. Rpt. Ga. Agr. Exp. Sta.*, 1944-45.) Studies were continued in 1945, in co-operation with the Seedling Disease Committee, for comparing new dust disinfectants; New Improved Ceresan, Du Bay 1452, Dow 9 (zinc phenolate), Mersolite (5 per cent. phenyl mercuric acetate in talc), and several purely organic compounds were compared at three rates of application. New Improved Ceresan at the rate of 1 and 1½ oz. per bushel was found the most effective commercially available material. DuBay 1452 and Dow 9 appeared equally as effective, but are still commercially unavailable. The latter two materials are probably preferable to Ceresan in certain characters, being somewhat less disagreeable to handle. Dow 9, with a zinc radicle, would be considerably less toxic to human beings and animals than are the mercury compounds Ceresan and DuBay 1452. Mersolite and several organic compounds tested were not satisfactory. Methyl cellulose (Methocel) was studied to determine the effect on emergence of dipping fuzzy and reginned seed in a 5 per cent. solution. The seed was dried and treated with Ceresan and compared with untreated lots. Approximately 27 per cent. more seedlings emerged under very unfavourable conditions from the Methocel-treated lots in comparison with untreated seed. The material is considered worthy of further study in relation to seedling emergence. Additional studies were made with Methocel-treated cotton seed in which the seed was enclosed with a thick layer of Methocel, inert material, disinfectants, and a nitrogen compound. This treatment resulted in a uniform shape and size, and facilitated uniform dropping with a plate planter. Due to heavy rainfall resulting in washing and crusting of the soil, the effect of these materials on seedling emergence could not be evaluated.

MACHINERY.

270. Cotton Harvesting Machine. International Harvester Co. (*Text. Mnfr.*, **72**, 1946, p. 35. From *J. Text. Inst.*, xxxvii, **3**, 1946, A83.) A mechanical cotton picker is illustrated and its functioning briefly described. The cotton is plucked by means of moistened, barbed spindles which are stripped by rubber doffers and the cotton is deposited into an air current set up by a suction fan. Some cleaning is effected by means of grids and the cotton is then transferred by a rotor to an air blast and further cleaned against grids. The cotton is finally collected in a basket chamber which can be tilted for emptying.

PESTS, DISEASES, AND INJURIES, AND THEIR CONTROL.

271. Climate and Insect Life. By Dr. C. B. Williams. (*Nature*, 23/2/46, p. 214.) The author states that the effect of climate and weather conditions on insects is only one particular part of the wider study of bioclimatics, but it is worthy of separate consideration in view of the enormous number of species of insects, the possibilities that they have for very rapid changes in numbers, and their great economic importance as pests and as carriers of disease. The view is expressed that insects should be studied as far as possible in the field under natural conditions, and the work in this connection carried out at Rothamsted is briefly discussed.

272. Problems of Nomenclature. By T. D. A. Cockerell. (*Nature*, 5/3/45, p. 548.) The writer recommends that the codes of botanical and zoological nomenclature be made uniform, and that *nomina seminuda*—i.e., names introduced informally, without proper descriptions, yet adopted by later workers—should not be rejected absolutely, and that sub-specific names should be valid when raised to specific status. The citation of authors' names is regarded as unnecessary and should be omitted.

273. DDT Insecticide: Colorimetric Determination. By M. S. Schechter *et al.* (*Ind. Eng. Chem. Anal. Edn.*, **17**, 1945, p. 704. From *Summ. Curr. Lit.*, xxvi.

3, 1946, p. 63.) A colorimetric method has been developed for the determination of small amounts of DDT down to about 10 μ g. The method depends on intensive nitration to polynitro derivatives and the production of intense colours on addition of methanolic sodium methylate to a benzene solution of the nitration products. This colour reaction can also be used as a test for degradation products of DDT, and some compounds related to it. The procedure is fully described, and the method is discussed. There are 28 references to the literature.

274. DDT Insecticide: Preparation and Properties. By S. J. Cristol and H. L. Haller. (*Chem. and Eng. News*, **23**, 1945, p. 2070. From *Summ. Curr. Lit.*, xxvi, **3**, 1946, p. 65.) A review is presented of the history of DDT, its chemistry, preparation, properties of major constituents, analytical procedures, and analogues. There are 49 references to the literature.

275. Effect of Nicotine Applied with Calcium Arsenate at Different Times of Day upon Cotton Aphids and Yields. By M. T. Young *et al.* (*J. Econ. Ent.*, **38**, 3, 1945, p. 383. From *Exp. Sta. Rec.*, **94**, 2, 1946, p. 232.) Previous reports indicated that increases in population of the cotton aphid can be prevented by adding nicotine to the calcium arsenate used against the boll weevil. Information is here briefly summarized as to the effects on aphid infestation of the combination as applied at different times of day. Results in the different experiments varied greatly. Late-afternoon applications gave an average increase over early-morning applications of 125 lb. of cotton per acre, which is within the limits of experimental error. Midday applications gave no appreciable control of aphids in the one experiment made.

[*Cf.* Abstr. 412, Vol. XXI. of this Review.]

276. Effect of Reduced Amounts of Calcium Arsenate on Boll Weevil Control and Cotton Yield. By R. C. Gaines. (*J. Econ. Ent*, **38**, 3, 1945, p. 300. From *Exp. Sta. Rec.*, **94**, 2, 1946, p. 232.) In field-plot experiments at Tallulah, Louisiana, 1933-43, the amount of calcium arsenate applied either alone or in mixture was greatly reduced from the average of about 6 lb. per acre; the dosages used in these tests significantly influenced the percentage of boll weevil control, but the effect on yields was not significant. Reductions in the amounts of the arsenate applied in cage tests were also followed by reduction in boll weevil kill.

277. A Comparative Study on the Morphology of Cutworms. I. External Morphology. By S. Tseng. (*Rev. App. Ent.*, xxxiv., Ser. A, **4**, 1946, p. 116.) Details are given of the external morphology of the larvae of *Agrotis tokionis*, *A. ypsilon*, *A. c-nigrum*, and *Euxoa messoria*, the four cutworms known to be injurious in China, with special attention to characters by which the species can be distinguished.

278. Cotton Jassid in the Punjab. VI. New Species Found on the Cotton Plant in the Punjab. By M. Abbas and M. Afzal. (*Ind. J. Agr. Sci.*, xv, **3**, 1945, p. 119.) In previous literature on cotton jassids *Empoasca devastans* Dist. has been invariably mentioned as the chief species attacking cotton in the Punjab. Three new species have recently been discovered on cotton, *Empoasca minor*, Pruthi, *E. kerri* var. *motti*, Pruthi, and *E. punjabensis*, Pruthi, but at present they appear to cause little injury to the cotton plant.

[*Cf.* Abstr. 162, Vol. XXII. and Abstr. 98, Vol. XXIII. of this Review.]

279. Experiments on the Resistance of Chickenfoot Cotton (*Gossypium arboreum*, L.) to the Cotton Leafroller (*Sylepta derogata*, Fab.). By M. Cheo. See Abstr. 312.

280. Locusts in the Sudan. (*Crown Col.*, May, 1946, p. 366.) The 1945-46 war against locusts in the Sudan has been won, though Kassala had a hard fight owing to extensive hatchings in the Gash Delta. However, it is estimated that the loss of grain has been 46,000 tons less than in the previous year. In all areas the campaign was greatly helped by the Army; lorries were lent from the Sudan Defence Force to distribute poison bait, and Middle East Command provided wireless sets and operators, so that rapid communication over vast areas was established. A great army of men from various Government Departments was organized to help. It is too early to

forecast the scale on which the Sudan may be invaded this year, but a campaign even greater than the previous one is being planned to save valuable cotton and grain crops.

281. Une Épidemie Fongique du Criquet *Zonocerus variegatus*, L. due a *Empusa grylli* (Fres.) Nowak. By F. L. Hendrickx. (*Comm. de L'Ineac.*, **1**, 1943. Received 1945.) In 1939 *Zonocerus variegatus*, L. caused much injury to cotton and *Pennisetum* during the dry season in Bambesa, Belgian Congo. Later, during the rainy season, the pest was attacked by a fungus disease said to be due to *Empusa grylli*. The results are given of a study of this parasite, and of its probable value in the control of *Zonocerus variegatus*.

282. The Internal Morphology of the Common Red-Spider Mite, *Tetranychus telarius*, Linn. By W. E. Blauvelt. (*Cornell Sta. Mem.*, 270, 1945. From *Exp. Sta. Rec.*, **94**, 2, 1946, p. 220.) This publication resulted from extensive and intensive studies of common red spider mites sectioned at 2μ-5μ and stained with Heidenheim's iron hæmatoxylin. Observations were also made of living specimens placed in various media. Information is included on synonymy, integument, mouthparts, digestive system, respiratory system, central nervous system, musculature, silk glands and other salivary glands, fat body, and female and male reproductive organs. A brief literature review is given on each of these points. The important literature references are cited, and 51 figures help clarify the descriptive morphological material.

283. Useful Parasitic Insects. By J. Harold Smith. (*Queensland Agr. J.*, **61**, 6, 1945, p. 340.) Brief accounts are given of various parasites attacking insect pests of cultivated crops, including *Lissopimpla semipunctata*, Kby., an ichneumonid parasite of cutworms, and *Winthemia lateralis*, Macq., a tachinid parasite of corn earworm.

284. Quelques Braconides Nouveaux du Genre *Microbracon*. By H. DeSaeger. (*Rev. Zool. Bot. Afr.*, **36**, 1943, p. 361. From *Rev. App. Ent.*, xxxiv., Ser. A, **3**, 1946, p. 81.) The author has found that the parasite of *Sylepta derogata*, F. on cotton in Tanganyika, recorded as *B.* (*M.*) *recessus*, Szépl., was misidentified, and is *B.* (*M.*) *bipustulatus*, Szépl., which is also recorded from an unknown host in Natal, and from *S. derogata* on *Hibiscus esculentus* in the Belgian Congo.

285. Cotton Leafspot *Rhizoctonia* and its Perfect Stage on Sugar Beets. By J. E. Kotila. (*Phytopathology*, xxxv., **9**, 1945, p. 741. From *Rev. App. Mycol.*, xxv, **2**, 1946, p. 66.) The *Rhizoctonia* isolated by D. C. Neal, in Louisiana, from cotton leaf spots caused damping-off of sugar beet seedlings under experimental conditions favouring the disease, the symptoms appearing three or four days after emergence and the stand being reduced to 61·5 per cent. of the control in ten days. At 21° to 25° C. and a relative humidity of 90 to 100 per cent. the cotton strain was mildly pathogenic to the foliage, the largest infected area ten days after inoculation measuring only 2 by 4 cm. The perfect state, which was not observed on cotton, developed both on sand-maize meal and the foliar lesions, the hymenoal cells, basidia, sterigmata and basidiospores agreeing with those of representatives of the group formerly referred to *Corticium vagum* (or *Pellicularia filamentosa*) [*C. solani*]. The average spore dimensions were 8·8 by 6·9 μ, and the length of the sterigmata approximately equalled the longest spore diameter.

[*Cf.* Abstr. 179, Vol. XXII. of this Review.]

286. Mildewproofing. By V. P. Giddings. See Abstr. 325.

287. Mildewproofing of Cellulose Fibres. By H. C. Borghetty. See Abstr. 326.

288. Influence of Carbohydrate Levels and Root-Surface Microfloras on *Phymatotrichum* Root-Rot in Cotton and Maize Plants. By F. M. Eaton and N. E. Rigler. See Abstr. 311.

289. Georgia: Wilt Resistant Strains of Empire Cotton. See Abstr. 233.

290. A Manual of the Aspergilli. By C. Thom and K. B. Raper. (Baillière, Tindall and Cox, London, 1945. £1 18s. 6d. From *Rev. App. Mycol.*, xxv., **3**, 1946, p. 141.) This valuable book is designed as an aid to the identification of the members of the genus *Aspergillus*; as the authors point out, it is not a mono-

graph, and is an entirely new work, not a new edition of the well-known "The Aspergilli" of Thom and Church. The first six chapters comprise a general discussion of the history, classification, morphology, laboratory treatment, and variation of the genus. Of the following fifteen chapters the first explains the use of the manual, with keys based on colour and morphology, and the others are each devoted to one of the main groups into which the genus is subdivided. The final four chapters provide topical and general bibliographies, a full check list of species, and a list of the species and varieties accepted by the authors. This last list comprises 77 species, eight varieties, and four mutants (the sub-specific rank "mut." is adopted, though this is not provided for by the International Rules of Nomenclature). The descriptions given are based on the authors' observations of large numbers of isolations, including type cultures whenever this has been possible; a few species known only from type material and literature are, however, accepted. One new variety is recorded: *A. terreus* var. *aureus*, from Texas soil (without a Latin diagnosis).

291. THE BACTERIAL CELL IN ITS RELATION TO PROBLEMS OF VIRULENCE, IMMUNITY, AND CHEMOTHERAPY. By R. J. Dubos. (Oxford Univ. Press, 1945. From *Exp. Sta. Rec.*, **94**, 3, 1946, p. 313.) A considerable body of knowledge concerning the biological and chemical architecture of bacteria is slowly emerging. It is the purpose of the present volume to integrate this information from various indirect methods with the data obtained by the classical techniques of cytology and to interpret some of the phenomena of the infectious process in terms of the biochemical architecture of the bacterial cell.

292. AUTOSYNTHETIC MOLECULES. By T. F. Dixon. (*Nature*, 19/3/45, p. 598.) A review of recent developments in the study of virus and gene reproduction.

GENERAL BOTANY, BREEDING, ETC.

293. PROGRESS REPORTS FROM EXPERIMENT STATIONS, 1944-45. (Pubd. by the Empire Cotton Growing Corporation, 1946. Price 3s., post free.) Progress reports are included summarizing the work carried out during the 1944-45 season at the experiment stations in Queensland, South Africa, Southern Rhodesia, Sudan, Uganda, Tanganyika Territory, Nyasaland, Nigeria, and the West Indies. The reports on the work in Queensland, Nigeria, Uganda, and the West Indies are included by courtesy of their respective governments. Useful work was continued at the stations in connection with cotton genetics and breeding, varietal trials, fertilizer experiments, rotation of crops, and in research on cotton pests and diseases. Programmes of experiments for the 1945-46 season are included. The reports should prove of much interest and value to all who are concerned in any way with the cultivation of cotton and similar crops.

294. THE PLACE OF SCIENCE IN INDUSTRY. (*Advanc. Sci.*, **3**, 1945, p. 106. From *Pl. Bre. Abs.*, xv., **4**, 1945, p. 302.) A report is given of a conference held by the Division for the Social and International Relations of Science of the British Association, to discuss the application of science to industry. The various papers will be of general interest to plant breeders, especially the paper by Darlington on applied biology.

295. INTERNATIONAL GENETICS CONFERENCE. (*Nature*, 12/1/46, p. 35.) At the Seventh International Genetics Conference, held in London during October 31-November 2, 1945, many papers were read and discussed. Dr. C. D. Darlington, President of the Genetical Society, summarized the development of plant genetics in Britain since 1939; Prof. J. B. S. Haldane reviewed the advance in animal genetics, treating the groups in systematic order from crustacea to man; Dr. Julian Huxley discussed the development of genetics in Great Britain in relation to systematics and ecology. A session on plant breeding was opened by Prof. O. Winge (Copenhagen), who described the work he had carried out since discovering the processes of sexual reproduction in yeast. Delegates from Holland, Belgium, France, Sweden, and Peru also reported on the genetical work in progress in their respective countries.

A discussion followed on the future of genetics. The Conference showed that, in spite of the war, decisive developments had occurred independently in the different countries represented. These developments were comprehensively summarized by Prof. Muller in his lecture, where he pointed out the primary importance of the concept of the gene in biology and more particularly in the application of physical and chemical methods to biology. It has, however, been on account of the war that a fuller use is now going to be made of this new genetics both in teaching and research in many different countries. A new epoch seems to be beginning in which biology will be treated as a whole.

296. Indore Institute of Plant Industry: Progress Report of the Cotton Genetics Research Scheme, 1944-45. Genetical studies on fuzz grades in *G. hirsutum* have confirmed the simple dominance of tufted over fuzzy condition only when the parents belong to the same variety. It has been demonstrated for the first time that even varieties of the same species can differ in their modifier background with regard to fuzz genes; it has also been shown that the dominance of the tufted condition can be reversed, and that fuzz grades even beyond 10 can be obtained by the action of modifiers. The repetition of the X-ray experiment with M.U.4 confirmed the previous results—namely, that by exposing the seed to X-rays and selecting from the F_2 progeny individuals with high means for ginning percentage and halo lengths, new varieties can be built up which are an improvement over the untreated seed. The simple recessive nature of the 5-lock condition in *G. arboreum* has been confirmed, and the gene found to be independent in inheritance of several other known genes. A cross made between Bishnor and Malvi to study the inheritance of boll size shows large boll size to be nearly dominant. The genetic red leaf in *G. hirsutum* is shown to be different from the red leaf caused by jassid attack, and in the absence of jassid the red leaf does no harm to the plant, being to a large extent dependent upon environmental conditions, such as time of sowing, soil fertility, etc. Studies in connection with jassid resistance indicate the necessity for growing the selected cotton strains at different dates during the season to be absolutely sure of their resistant nature. An apparently homozygous strain for wilt resistance out of Dhar 43 grown under controlled conditions in the glass-house produced only 8 per cent. mortality. An F_2 of a cross between Dhar 43 and Chinese Red Spotless, grown in pots with plenty of wilt compost, gave 29 per cent. mortality due to wilt. The original hybrid *G. arboreum* × *G. thurberii*, which was sterile due to defective anthers, became fertile during the monsoon period, giving bolls and seed, but reverted to sterility again during the winter and summer months. The undoubled hybrid *G. hirsutum* × *G. raimondii* was backcrossed to *hirsutum* without any success. The doubled hybrid gave both bolls and seeds. In an experiment with different placements of fertilizers, drilling was found most suitable for groundnut cake and broadcasting for ammonium sulphate. In a small-scale field trial with four varieties of cotton, two American and two *desi*, grown from vernalized seed, success was obtained only with the American, the treatment inducing earliness in the crop. Experiments have shown the commonly-adopted method of growing progeny rows in long continuous strips with controls at regular intervals to be unsatisfactory, an arrangement in compact blocks being considered definitely superior.

297. Genetics of the Microfungi. By C. T. Ingold. (*Nature*, 11/5/46, p. 614.) At its morning meeting in London, on December 19, 1945, the Society for General Microbiology, with Sir Alexander Fleming in the chair, discussed the question of "Variation of Cells having Bi-parental Inheritance," and the papers and discussion, which are briefly reviewed, dealt largely with the genetics of the microfungi. The author writes in conclusion that "something is now known of the genetical causes of the instability of pure cultures originating from single cells or single spores. In yeasts genetical segregation may occur, in cultures started from a single cell, at ascus formation. In conidial fungi with multinucleate spores heterokaryosis may be the cause of variation. Finally, in any cell and at any time gene-mutation may occur."

298. Biological Stimulation in Germination. By R. Brown. (*Nature*, 19/1/46, p. 64.) A survey is given of the literature on the stimulation of fungus spores, seeds, and pollen grains by biological agencies. The author concludes that there is abundant evidence to show that with certain fungal spores, pollen grains and seeds, germination will not occur when external supplies of particular activators are not available. Normally the activators are produced in actively metabolizing tissues from which they are released into an aqueous medium, and from which, in turn, they are absorbed by the appropriate spores, pollen grains or seeds. The evidence indicates that different activators are involved in the stimulation of different dormant tissues, and that each activator may be produced in the tissues of a large number of species. It is suggested that the activators are of importance in the metabolism of the stimulating as well as of the stimulated tissue, and the hypothesis is proposed that the dependence of the latter on an external supply of the activator is due to a failure to synthesize this or a similar substance. Tissues that do not require stimulation differ from those that do, in synthesizing the essential substances in the course of development.

299. Ontogenetic Development and Yield of Cotton as Influenced by the Proportion of Mineral Elements in the Nutrition. By A. A. Kuzmenko *et al.* (*Comp. Rend. Doklady de l'Acad. des Sci. de U.S.S.R.*, xxxi., **3**, 1941, p. 273.) An account of experiments carried out in 1939 and 1940 to discover the phase at which the cotton plant should be supplied with the greatest amount of plant nutrients in order to obtain the highest yields of raw cotton. The results indicated that for the best growth, development, and yield the plant needed the greatest amount of nutrients when it had formed three or four leaves. When an N.P.K. ratio of 4 : 4 : 1 was applied at this phase the total weight of the plant was 15·73 grm. and the weight of raw cotton 3·30 grm., but if applied later the weights were only 9·51 and 1·96 grm. respectively. It was also noted that with increased rates of nitrogen, phosphorus and potassium in Hellriegel's solution, supplied in the period between the appearance of the fourth leaf and the onset of budding, the cotton plant reached maturity seven days earlier.

300. Elements of Bacterial Cytology. By G. Knaysi. (Comstock Pubg. Co. Inc., Cornell Univ., Ithaca, N.Y., 1944. Reviewed *Pl. Bre. Abs.*, xv., **4**, 1945, p. 373.) "It would be difficult to imagine a less promising subject for a textbook than bacterial cytology, and if one approached this book purely from the standpoint of the student of the cytology of the higher plants and animals, one would be tempted to say that 'it is not well done, but the wonder is that it can be done at all.' To do so would be to criticize the book for not being what it does not pretend to be. The author's aim is set out clearly: 'Knowledge of the structure of the bacterial cell should be an integral part of the training of every modern bacteriologist.' The difficulty is, of course, that owing to the smallness and diversity of the material, bacterial cells, the purely descriptive stage of this branch of biology is still only developing. The technique used, including new staining procedures and dark field, ultra-violet and electron microscopy, is advanced, but the subject, owing to its inherent difficulties, advances slowly, far behind other branches of cytology.

"The author has performed a valuable service to biologists in general as well as to bacteriologists, in giving as clear a picture as he has of the present state of our knowledge of bacterial cytology. The book is mainly devoted to the bacteria proper, physiological as well as morphological aspects being covered. There are also chapters on the Actinomycetes, the Spirochetes, and the Myxobacteria. An extensive bibliography and a subject index are provided. Ample illustrations are given, a noteworthy feature being the abundance of electron-microscope photographs. A disappointing feature of the illustrations is the failure to give indications of the magnification used."

301. The Cytological Analysis of Species Hybrids.—II. By G. L. Stebbins, Jnr. (*Bot. Rev.*, xi., **9**, 1945, p. 463. From *Exp. Sta. Rec.*, **94**, 3, 1946, p. 322.) This critical review (167 references) supplements one of the same title by K. Sax

(1935); the present author considers the factors involved in chromosome pairing, fertile species hybrids, species hybrids with slight irregularities of meiosis, structural hybridity and its effects, hybrids with very irregular meiosis, and the origin of hybrid sterility.

302. WHAT IS HEREDITY? By T. Dobzhansky. (*Science*, **100**, 1944, p. 406. From *Pl. Bre. Abs.*, xv., **4**, 1945, p. 318.) In reply to an article by Dice, it is pointed out that it is not characters, morphological or psychological, that are inherited in the strict sense of the term, but rather norms of reaction to various environmental factors.

303. NOTE SUR L'EMPLOI DES DIAGRAMMES DE PURÉTÉ EN AMÉLIORATION COTONNIÈRE. By R. De Poerck. (*Comm. de l'Ineac.*, **1**, 1943. Received, 1945.) Describes the method of using purity diagrams in cotton selection work, and the limits of their employment for the purpose.

304. ON THE INFLUENCE OF THE STOCK UPON THE SCION IN COTTON. By N. M. Konstantinov. (*C.R.* [*Doklady*] *Acad. Sci. U.S.S.R.*, **46**, 1945, p. 159. From *Pl. Bre. Abs.*, xv., **4**, 1945, p. 356.) Late maturing varieties have been grafted at the cotyledon stage on to the following stocks: (1) an arborescent type incapable of natural blooming under the conditions of long day at Tashkent, (2) an extremely early annual cotton, and (3) F_1 hybrids from the cross *G. hirsutum* × *G. barbadense*. With the exception of the first, all the stocks had reached the reproductive period at the time of grafting. Rate of development of the scion, reproduction capacity, and general appearance were markedly influenced by those of the stock.

305. COTTON ROOT BARK ELECTRO-DIALYSABLE CONSTITUENTS: IDENTITY. By D. R. Ergle *et al.* (*J. Amer. Chem. Soc.*, **68**, 1946, p. 48. From *Summ. Curr. Lit.*, xxvi., **7**, 1946, p. 152.) The results are presented of a systematic attempt to isolate and identify definite organic compounds, principally nitrogenous, from the electrodialysates of cotton root bark. Arginine, asparagine, and betaine were isolated in significant quantities, and account for approximately half of the total organic nitrogen content of the catholyte (1·48, 40·97, and 4·42 per cent. respectively). Oxalic acid was also identified.

306. A STATISTICAL STUDY OF THE BOLL FORMATION IN COTTON. By D. N. Nanda and M. Afzal. (*Ind. J. Agr. Sci.*, xv., **3**, 1945, p. 116.) *Summary.* A logarithmic equation of the third degree was fitted to the bolling data of cotton, and it was found that although the mean squares were significant up to the fifth degree in a few cases, it was considered that the third degree would give a very good fit. The relative rate of boll formation varied with the time. This had to be the case because the rate of flower production was also found to vary likewise. It has also been possible to calculate the average rate of boll-shedding, and it was found that early maturing varieties had comparatively higher rates of boll-shedding than the late-maturing varieties.

307. LES RÉCHERCHES COTONNIÈRES EN AFRIQUE DU NORD. By E. Miège. (*Un. Coton. Emp. Français*, 1942, p. 15. From *Pl. Bre. Abs.*, xv., **4**, 1945, p. 356.) An historical account is given of cotton breeding in Algeria, Tunisia, and Morocco. Hybridization studies are mentioned and several of the more important varieties are described; attention is drawn to the fine quality of derivatives of the variety Pima. Genetical studies have been made of valve number and villosity. A bibliography of 94 titles is appended.

308. WILD SPECIES MAY AID IN BREEDING BETTER COTTONS. By J. O. Beasley. (*Cott. and Cott. Oil. Pr.*, **43**, 16, 1942, p. 5. From *Pl. Bre. Abs.*, xv., **4**, 1945, p. 356.) A popular account is given of the problems encountered in crossing various wild species and the cultivated American cottons, before and since the use of colchicine. An indication is given of the possible development from such hybrids of cottons with almost round fibres, finer fibres than those of the Upland cottons, and with resistance to certain insects and diseases.

309. EFFECT OF LIGHT INTENSITY, NITROGEN SUPPLY, AND FRUITING ON CARBOHYDRATE UTILIZATION BY THE COTTON PLANT. By F. M. Eaton and N. E. Rigler. (*Pl. Physiol.*, **20**, 3, 1945, p. 380. From *Exp. Sta. Rec.*, **94**, 1, 1946, p. 35.) Green-

house studies in winter and outdoor tests in summer indicated that the level of nitrate supply has—in itself—no outstanding effect on fruitfulness relative to plant size in cotton; raises from a low level resulted in increases of both vegetative growth and number of bolls, but a toxically high concentration reduced both growth and number of bolls. At both light intensities—at midday, about 1,000 and 10,000 ft.-c., respectively—the plants on low nitrate (1 milli-equivalent per litre) were less than half as large as those on 4 and 16 m.e. of nitrate, and those on high nitrate (64 m.e.) were about three-quarters as large. In both experiments the relative fruitfulness values for 1- and 64-m.e. plants were actually a little higher than those for plants supplied with 4 and 16 m.e. Under low light these values were 4·46, 3·47, 3·36, and 4·09, and under high light 6·75, 6·42, 6·43, and 7·58 for the four respective nitrate levels. As to fresh weight, the 1- and 64-m.e. plants differentiated more nodes and flower buds than the other two groups, and their shedding percentages were higher. At the respective nitrate levels, the fresh weight of stems and leaves in the low-light experiment were nearly the same as the corresponding weights under high light, but the high-light plants were far more fruitful. The mean temperatures in the two series were similar. Each of the experiments included fruited plants and those from which all floral buds were removed as they attained a bract width of about 15 mm., the debudded plants being included to aid in differentiating the effects of treatment and of fruiting. Debudding resulted in an increased number of main stalk and fruiting branch nodes and in a large increase in the weight of stems and leaves. The latter was much less in the low- than in the high-light series, which accords with the lower weight of bolls under the low light. High nitrate was more toxic to fruited than to debudded plants. Carbohydrate concentrations were lowest in plants supplied with 4 m.e. of nitrate, lower in fruited than in debudded plants and under low than under high light, and lower in the leaves than in the root bark. Shedding of very small floral buds was a prominent feature in the growth of the fruited plants under low light at all nitrate levels, but bud shedding under high light was negligible in them, as well also as in the debudded plants under both light intensities. Square shedding thus occurred only from plants with the lowest carbohydrate concentrations. The 64 fold increase in N concentration in the substrate tended to double the N content of the leaves and to quadruple that in the root bark. Higher N concentrations were found in the debudded than in the fruited plants and also under high light than under low light. This accords with the extent of carbohydrate accumulation in the root bark. The data on fruitfulness and on carbohydrates and N accumulation afford little or no basis for attaching special significance to carbohydrate : N ratios in cotton. Fruiting itself influenced this ratio as much as did the nitrate supply; the actual magnitudes of the carbohydrate and N concentrations, however, were both informative. In both experiments it appeared that limited carbohydrate supply was responsible for much of the boll shedding. In the high-light plants, however, sugar and starch concentrations were 2·7 times as high as in the low-light plants. The fact that carbohydrate concentrations were not reduced in the high-light plants to levels found in the low-light plants before shedding occurred was interpreted as indicating that high light sets in motion some factor that depresses carbohydrate utilization. Fruiting activities had a greater dominance over vegetative growth under high than under low light. There are 35 references.

310. COTTON PLANT: PHOTOSYNTHESIS AND SOIL SALINITY. By L. P. Zhdanova. (*Doklady Akad. Nauk.*, **45**, 1944, p. 373. From *Summ. Curr. Lit.*, xxvi., **2**, 1946, p. 35.) *Gossypium hirsutum* (Egyptian and American) and *G. barbadense* (Egyptian) have greater resistance to inorganic salts than *G. herbaceum* (Guza), as shown by measurements of the rate of photosynthesis in two groups of experiments. In one group, van't Hoff-Richter saline solution was applied to the soil and in the other experiments 0·1N solutions of NaCl and Na_2SO_4 were applied to the leaves. In the latter group of experiments photosynthesis was inhibited more by the sulphate than by the chloride.

311. Influence of Carbohydrate Levels and Root-Surface Microfloras on *Phymatotrichum* Root-Rot in Cotton and Maize Plants. By F. M. Eaton and N. E. Rigler. (*J. Agr. Res.*, **72**, 4, 1946, p. 137.) In potted soils and in the field it was found that the susceptibility of cotton plants of fruiting age to *Phymatotrichum* root-rot is related to the carbohydrate content of the root bark. Carbohydrate levels were altered by such means as partial defoliation, defruiting, branch removal, and adjustments in nitrogen supply. With increasing carbohydrate concentration resistance was increased, and plants sufficiently high in carbohydrates withstood attack. Seedling cotton plants are highly resistant to *Phymatotrichum* root-rot, and this resistance was not altered by changes in carbohydrate levels. Likewise, the reactions of seedling cotton plants grown on sterile sand-bentonite substrates showed the resistance to be largely independent of any protection afforded by root-surface saprophytes. A mass attack of *Phymatotrichum omnivorum* produced lesions on seedlings grown on agar substrates, but it seemed doubtful that the living seedling tissues would independently support fungus growth. That the resistance factor is independent of current photosynthetic activity was shown by the similarly weak attack on seedlings growing on agar cultures in flasks kept in a dark chamber and on those exposed to the light. The correlation between carbohydrate concentration and the resistance of cotton to root-rot is believed to reflect antibiotic protection at the higher carbohydrate levels. It was found that the microbial equilibria on the surfaces of cotton roots were markedly altered as the carbohydrate concentration within the roots was increased. The number of certain organisms tended to increase through successive carbohydrate levels, whereas others decreased. The existence of an important interaction was demonstrated between root-surface saprophytes and the parasitic activity of the root-rot fungus, *Phymatotrichum omnivorum*, by means of experiments with maize. After inoculation with *P. omnivorum*, maize plants growing on sterile sand-bentonite substrates were rapidly attacked and killed. The roots of maize plants on otherwise similar but non-sterile substrates remained healthy even though paralleled for long distances by strands of the fungus.

A list of 35 references to the literature on the subject is included.

312. Experiments on the Resistance of Chickenfoot Cotton (*Gossypium arboreum*, L.) to the Cotton Leafroller (*Sylepta derogata*, Fab.). By M. Cheo. (*Tech. Bull. Fukien Prov. Coll. Agr.*, No. 17, Yungan, Fukien, 1943. From *Rev. App. Ent.*, xxxiv., Ser A, **4**, 1946, p. 120. In Chinese, with a summary in English.) Investigations were carried out at Hangchow in 1935-38 to determine whether differences in the size and shape of cotton leaves, which are very variable, are correlated with resistance to *Sylepta derogata*, F., which is one of the most injurious cotton pests in China. The comparison was between a number of varieties having relatively undivided leaves and two varieties of *Gossypium arboreum* (*neglecta* and *rosea*), in which the leaves are divided into 5-7 narrow, oblong, lanceolate lobes. In insectary experiments with 20 cages, each containing two pairs of newly-emerged adults of *S. derogata* and two plants, one with divided and the other with undivided leaves, the average number of larvæ per plant after 20 days was significantly lower on each of the varieties with divided leaves than on the variety with which it was compared. In another experiment in which ten potted seedlings of each of the varieties with divided leaves and of six of those with undivided leaves were arranged in randomized blocks in a large outdoor screen cage, in the centre of which 25 pairs of newly-emerged moths were liberated, there were fewer rolled leaves on the divided-leaf varieties than on the others when the plants were examined 20 days later, and in most cases the difference was statistically significant. In a field experiment, using *G. arboreum neglecta* and seven varieties with undivided leaves in randomized blocks, the percentage of plants on which 50 per cent. or more of the leaves were rolled by the larvæ was only 9·05 on the former and over 95 on the latter varieties. No significant differences in infestation were found among the varieties with undivided leaves.

313. Cotton Fibre: Strains Grown Influence Quality. By J. H. Moore.

(*Res. and Frmg.*, 3. Raleigh, N.C., 1945. *Progr. Rpt. No.* 3, p. 3. From *Pl. Bre. Abs.*, xv., **4**, 1945, p. 356.) The factors making up the quality of cotton fibre are discussed, and it is suggested that the usual commercial evaluation based upon staple length, ginning outturn and yield does not provide a complete estimate of quality, but that fineness, strength, and other properties of the fibre should also be considered. Work was begun in 1934 at the North Carolina Experiment Station with the object of investigating the influence of variety upon fibre quality. Strains have been inbred for nine generations; no injurious effects have been observed as a result of this inbreeding. Differences within varieties for staple length and fibre diameter are reported.

314. GEORGIA. BREEDING COTTON FOR WILT RESISTANCE. (*57th Ann. Rpt. Ga. Exp. Sta.*, 1944-45.) The major planting was made on the John Mask farm, six miles south of Plains. This plot has been in continuous cotton for 20 years and is well infested with the cotton wilt organism and nematodes. Advanced hybrids were tested in the commercial variety tests. For two years, 1943-44, CSS 3720 performed favourably in comparison with established varieties.

Attempts are being made to improve the fibre tensile strength of wilt-resistant cottons by combining adapted material with Hopi and Sea Island. Hopi crossed and backcrossed to Acala, and Hopi, in combination with Deltapine and Stoneville, are available as parental material. These will be combined with wilt-resistant material in 1945. Seabrook (Sea Island) crossed and backcrossed to Stoneville 2B has retained a considerable amount of the tensile strength of Seabrook. Backcrossing to Stoneville 2B will be continued, with attention being given to tensile strength and wilt resistance.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

315. AN INTRODUCTION TO THE CHEMISTRY OF CELLULOSE. By J. T. Marsh and F. C. Wood. (3rd Edn., Chapman and Hall Ltd., London, 1945. 32s. Reviewed *J. Text. Inst.*, xxxvii., **4**, 1946, p. 76.) From this lengthy review we give the following extracts: "The general arrangement of the subject-matter follows that of the second edition. A short general account of the occurrence and properties of natural forms of cellulose is followed by an account of the molecular constitution and the arrangement of the molecules in the fibre. This, although less logical from a purely historical standpoint than the sequence adopted in the first edition, where the discussion on molecular structure and arrangement came at the end of the book, is more generally satisfying. From the outset, a framework is provided to which many of the physical and reactional properties, dealt with in later chapters, can be referred. Then follow three sections dealing with dispersed celluloses, chemically modified celluloses, and cellulose derivatives. These correspond to the three main channels in which investigation and development have been directed by the pressure of industrial requirements. The section on constitution, following the historical development of the subject, lends itself to a more discursive treatment, and is rather easier to read than some of the other sections. It has been very usefully amplified by a general discussion on the formation and properties of chain molecules. This assists in the appreciation of evidence brought forward in a later chapter of the section dealing with the arrangement of molecules in the fibre and the relations of fibre structure to fibre properties. A passing glance is given to the chemistry of the hemicelluloses and the lignins, but because of their importance in contributing to a knowledge of cleansing and purification processes for the naturally occurring forms of cellulose, these two subjects could with advantage have been given greater space. . . . It is to be hoped that the sales of the present edition are already giving encouragement to the authors for the preparation of a fourth."

316. DOES COPPER NAPHTHENATE OXIDIZE CELLULOSE? By A. E. Bartlett and M. Goll. (*Amer. Dyes. Rptr.*, xxxiv., **12**, 1945, p. 225. From *Rev. App. Mycol.*, xxv., **2**, 1946, p. 75.) In a study of the catalytic effect of copper on the oxidation of cotton duck, cotton twine, and jute cordage, samples treated with copper sulphate

or copper naphthenate (depositing 0·6 per cent. metal on weight of fabric), alone or combined with additives (linseed oil and oxidation inhibitors in the case of the duck, and pine tar with the twine and cordage), were exposed to oxygen at 115° C. and to ultra-violet light in the fade-o-meter and losses in tensile strength determined. Some of the samples were subjected to 3 per cent. sodium chloride to simulate the action of sea-water before the application of the ultra-violet test, and others underwent 4½ months' exterior exposure at Elizabeth, New Jersey. The results of the experiments indicate that tendering is promoted by copper sulphate but not by copper naphthenate, which in conjunction with the various additives actually conferred protection against oxidative degeneration *as* well *as* microbiological damage.

317. Cotton: Application for Thermal Insulation. By R. H. Oppermann. (*J. Franklin Inst.*, **240**, 1945, p. 170. From *Summ. Curr. Lit.*, xxvi., **5**, 1946, p. 105.) A summary of a report issued by the U.S. Dept. of Agriculture. The high quality and convenient form of modern cotton insulation which has been made flame-resistant and water-repellent is pointed out. Of a dozen common insulating materials cotton has the best thermal insulating value, and is the lightest and cheapest in labour costs. To meet competition, raw cotton would have to be obtainable at 8 cents a lb. Cotton of low-middling and lower grades with sound staple 13/16 inch and shorter is satisfactory.

318. Trash in Cotton: Effect on Grade, Staple, and Price. By M. A. Grimes. (*Text. Wkly*, **36**, 1945, p. 972. From *J. Text. Inst.*, xxxvii., **2**, 1946, A38.) A report of an investigation in which 60 cottons, varying in fibre qualities, were collected from two regions in Texas over a period of four seasons, some being hand-picked or hand-snapped and others harvested by machinery and roughly cleaned before ginning, ginned on the same machine, and cleaned by means of the Shirley Analyser. Grade, staple, and price were evaluated by a board of examiners, before and after the removal of trash by the Analyser. The data are tabulated. The trash removed ranged from 3·7 to 32·8 per cent., making the cottons 2 to 6 grades better; average values for the 60 cottons were 9·1 per cent. and 4·2 grades. The effect on staple length was very slight; only 3 cottons varied by more than 1/16 inch after cleaning, and the Analyser did not do any appreciable damage to the fibre. The effect of cleaning on money value was arrived at on the basis of the cotton left after passage through the Analyser. The values covered a wide range: 16 cottons showed a loss in value, one as much as $13.88 per bale, and 44 a gain, one as much as $24.02. The average change in value was a gain of $7.11 per bale. The losses were mostly among the wasty cottons. The investigation suggests the need for modifications in marketing practices, either by cleaning the cotton at the gin or by selling cotton on the basis of its ascertained trash content.

319. Cotton Fibre: Grading and Testing. (*Textile World*, **95**, 12, 1945, p. 99. From *Summ. Curr. Lit.*, xxvi., **5**, 1946, p. 105.) In earlier days cotton was mainly graded on the basis of its agricultural properties. In 1941 a testing service was made available in the United States by which cotton breeders and others can obtain reports from the Department of Agriculture Testing Stations on the fibre properties and the spinning results of any sample of cotton submitted. Many tests have been developed to determine the characteristics of different strains. The present trend in cotton growing is towards fewer varieties.

320. Raw Cotton Fibre: Organic Acid Content. By E. R. McCall and J. D. Guthrie. (*J. Amer. Chem. Soc.*, **67**, 1945, p. 2220. From *Summ. Curr. Lit.*, xxvi., **5**, 1946, p. 106.) Four samples of raw cotton fibre have been analysed for organic acids and found to contain about 0·5 per cent. of *l*-malic acid and 0·07 per cent. of citric acid. The isolation of both these acids in crystalline form is described.

321. Industrial Cotton Fabrics: Durability. By B. Monsaroff. (*Canadian Chem.*, **29**, 1945, p. 458. From *Summ. Curr. Lit.*, xxvi., **6**, 1946, p. 127.) The reactivity of cotton is outlined by reference to the cellulose macromolecule and the limitations thus introduced into the processing of cotton are indicated. A low *p*H value for cotton is associated with a tendency to oxidize and hence with low dura-

bility. Deterioration is promoted—e.g., in dryer felts for paper—by the combined action of acid and excessive heat and the presence of aluminium sulphate and copper (as catalyst); the porosity of the felt is therefore important.

322. COTTON LINTERS: BLEACHING. By L. Thoria. (*J. Ind. Chem. Soc.*, 7, 1944, p. 123. From *Summ. Curr. Lit.*, xxvi., 2, 1946, p. 28.) Before bleaching, linters are washed in soap solution and then heated for six hours at 25-lb. pressure in a kier with 8 per cent. of NaOH and 1 per cent. of Igepon T, using a 10 : 1 liquor ratio. They are then washed, soured with 0·5 per cent. acetic acid, and washed free from acid. Addition of 1 per cent. of sodium aluminate reduces the effectiveness of the kier boil. Bleaching with buffered solutions of bleaching powder is optmum at *p*H 8·2-8·5—i.e., when 8-15 per cent. of hypochlorite is present. The presence of bicarbonate in the bleach liquor has a specific and advantageous effect. Bleach solutions should contain about 1·5 g. of available Cl per litre if degradation is to be avoided.

323. COTTON LINTERS: DETERMINATION OF STRUCTURAL COMPONENTS. By R. F. Nickerson and J. A. Habrle. (*Ind. Eng. Chem.*, **37**, 1945, p. 1115. From *J. Text. Inst.*, xxxvii., **3**, 1946, A104.) Samples of processed, high-viscosity, acetate-grade cotton linters were subjected to acid hydrolysis for varied times under controlled conditions, and the resulting insoluble residues were washed and dried. This series of hydrocelluloses was then investigated by the hydrolysis-oxidation method. The variations of cumulative carbon dioxide evolution with time for intact linters and for hydrocelluloses derived from them in the acid ferric chloride reagent are tabulated. The parent linters appear to contain approximately 3 per cent. of readily hydrolysed anhydroglucose, 3 per cent. of a gradually hydrolysed fraction, and 94 per cent. of slowly hydrolysed, resistant cellulose. These three fractions are also described as (1) the amorphous component, which apart from its complete accessibility to hydrolysis is highly hygroscopic, and has at least one molecule of water per hydroxyl group, (2) the mesomorphic component, intermediate in hydrolytic susceptibility and less homogeneous in itself than either of the other components, and (3) the crystalline component, representing the highly organized regions of the linters, characterized by its uniformly low hydrolytic reactivity.

324. COTTON LINTERS: GRAVIMETRIC ANALYSIS FOR FOREIGN MATERIALS. By T. L. Rettger. (*Oil and Soap*, **22**, 1945, p. 7. From *Summ. Curr. Lit.*, xxvi., **5**, 1946, p. 105.) A relatively simple and rapid gravimetric method for the determination of "foreign matter" in second-cut linters, but applicable also to first-cut lint and other cellulose fibres, enables the foreign material to be weighed and recovered for examination. The procedure is an adaptation of the method of the American Oil Chemists' Society for the determination of lint on cottonseed. The method is empirical in that only foreign material coarser than 50- to 100-mesh, depending on the sieve used, is recovered, the acid and friction treatments slightly reduce the size of particles, and leaf and shreds of stems disintegrate and are not fully recovered in size or amount, but the results are reproducible and representative of the sample.

325. MILDEW-PROOFING. By V. P. Giddings. (*Amer. Dyes. Rptr.*, xxxiv., **11**, 1945, p. 220. From *Rev. App. Mycol.*, xxv., **2**, 1946, p. 74.) The results of tests of treated cotton osnaburg and jute burlap samples by an accelerated soil-burial method, using a composted "greenhouse" soil consisting of sand, loam, and horse manure, outdoor weathering trials at New Orleans, Louisiana, and laboratory experiments involving inoculation with *Chætomium globosum* before and after an accelerated weathering test of 360 hours' exposure in an Atlas single-arc weatherometer, demonstrated the merits of copper compounds, notably copper naphthenate, cuprammonia, and copper ammonia fluoride. Outdoor service tests on sandbags prepared from these materials generally confirmed the ratings of the treatments by accelerated methods, but some differences in the relative status of the three above-mentioned compounds were indicated, and the performance of some others—e.g., copper tallate, copper oleate, and copper resinate—was superior to that observed in the accelerated series. The addition of creosote to copper naphthenate and other copper treatments extended their service life in outdoor exposure experiments.

326. Mildew-Proofing of Cellulose Fibres. By H. C. Borghetty. (*Rayon Text. Mon.*, xxvi., **9**, 1945, p. 479. From *Rev. App. Mycol.*, xxv., **3**, 1946, p. 131.) A full account is given of the investigations and experiments carried out to satisfy the requirements of the United States Quartermaster Depot for suitable methods and products for the protection of fibres and fabrics from rot and mildew.

327. Rot-Proofing of Canvas: Preliminary Report on Experiments carried out in 1944-45. By R. M. Brien and J. M. Dingley. (*N.Z. J. Sci. Tech.*, B, xxvii., **2**, 1945, p. 133. From *Rev. App. Mycol.*, xxv., **4**, 1946, p. 176.) At the request of the New Zealand Standards Institute a series of investigations was carried out to establish a suitable technique for testing preservatives for canvas, cordage, and the like. Of the numerous common moulds isolated from rotted canvas specimens, only *Memnoniella echinata* and *Stachybotrys atra* caused appreciable decay of the fabric, and of these the latter was selected as preferable for further trials on account of its prolific production of dark-coloured spores. A method was evolved whereby strips of 12-02 cotton duck, treated with seven chemicals at varying concentrations, were inoculated with *S. atra* and held for three to four weeks under optimum temperature (27°C.) and moisture conditions (tied to sterile 4-in. sections of porous earthenware field pipes 2-in. in diameter and placed in covered glass jars containing 60 ml. sterile water). In this series of tests sodium salicylanilide (shirlan W.S.) conferred protection against rotting at and upwards of 0·5 per cent., while sodium pentachlorphenate (santobrite) was effective from 0·05 to 2 per cent.; at the latter dosage, however, there was a significant loss in tensile strength. Pentachlorphenol and copper oleate in mineral turpentine exerted a preservative action at 0·5 and the copper and zinc naphthenates in mineral turpentine at 0·05 per cent.

In another series of experiments, in which the treated canvas strips were subjected to leaching by a rotating spray of water for ten 3-hour periods and dried after each for 1½ hours in an oven at 45° to 50° before inoculation, there was a greatly increased loss in tensile strength in those treated with salicylanilide and sodium pentachlorphenate even at the maximum strength, while in the case of pentachlorphenol a 3 per cent. concentration would evidently be necessary to prevent disorganization by *S. atra*. Phenyl mercuric acetate permitted significant loss in the tensile strength of leached strips at 0·01 and 0·05 per cent. Leaching did not materially impair the efficiency of copper naphthenate even at the minimum concentration, but in the specimens treated with zinc naphthenate and copper oleate the reductions in tensile strength were heavy at 0·1 and significant at 0·5 per cent.

328. The Form and Length of the Drafting Wave in Cotton Rovings. By G. A. R. Foster and J. C. Martindale. (*J. Text. Inst.*, xxxvii., **1**, 1946, T1.) The correlation periodograph enables a reasonably accurate estimate to be made of the length of the drafting wave produced in slivers or rovings in which the fibres have been parallelized by previous drafting. Its application to the study of the nature of the drafting wave and to the measurement of its length is described. Earlier conclusions that the wave is an oscillation which is characteristic of a system that tends to vibrate with a fundamental natural period, depending on the drafting conditions, but that this oscillation is disturbed by the irregularities in the ingoing sliver or roving, are confirmed, and it is shown that in the drafting of normally twisted products the disturbances are so great that an oscillation once started is almost obliterated after about one period. When, however, the twist in the entering roving is higher, the oscillations persist for two or three periods, and consequently the wave is much more regular in length, and is also greater in amplitude. It is suggested that the disturbances are due mainly to variations in cohesion and openness of the cotton.

329. Cotton Blowrooms: Fire Hazards. By W. E. Peterson. (*Text. World*, **96**, 1, 1946, p. 94. From *Summ. Curr. Lit.*, xxvi., **9**, 1946, p. 185.) A fire-prevention study of machinery, methods and machine layouts in opening and scutching rooms has been made by engineers of fire insurance companies, and results from surveys of 212 mills have been compiled. Recommendations put forward include a maximum speed of 800 r.p.m. for vertical openers, 550 r.p.m. for horizontal cleaners, and 400

to 500 r.p.m. for the centrif-air machine. Magnetic separators help to prevent fires by removing foreign materials from the cotton. In an opener line the centrif-air machine or the horizontal cleaner should precede the vertical opener. The maximum production rate per opener line from the standpoint of better fire prevention is approximately 1,000 lb. per hour. Benefits are also to be derived from moisture in the opener room. No ties or buckles should be removed from bales within the opener room building.

330. Cotton Mill Management: (1) By E. Kidd. (2) By M. H. Winder. (*Text. Wkly*, **36**, 1945, p. 1190; **37**, 1946, p. 66. From *J. Text. Inst.*, xxxvii., **3**, 1946, A139.) (1) A report of an address and discussion on modern problems of spinning-mill management, including maintenance of yarn elasticity and strength, cotton selection, the reduction of weight carrying by operatives, "training within industry," and working hours. (2) A report of a companion address, with special emphasis on the value of "training within industry" and the works council.

331. Cotton Mill: Electric Driving. (*Elect. Rev.*, **138**, 1946, p. 239. From *Summ. Curr. Lit.*, xxvi., **5**, 1946, p. 109.) A report is given of a visit to the three mills of Sladen Wood Mill Co., which are entirely electrified. An outline is given of the processes in order of production (opening to weaving), and is illustrated by ten good photographs. Particulars of the motors are supplied.

332. Cotton Mills: Conversion of Drives. (*Elect. Rev.*, **138**, 1946, p. 519. From *Summ. Curr. Lit.*, xxvi., **9**, 1946, p. 185.) A description is given of some of the electrical conversion schemes embraced by the modernization programme now in progress at three mills of Fothergill and Harvey Ltd. A triple-expansion vertical marine engine which now drives machinery on four storeys of the building will be replaced by a number of motors. Wherever practicable individual drives will be installed in place of group drives. Smoother and quieter running is secured for the winding frames by the replacement of spur-geared motors by motors with V-belt transmission.

333. Cotton Mills: Ventilation and Dust Control. (*Text. World*, **96**, 1, 1946, p. 113 *et seq.* From *Summ. Curr. Lit.*, xxvi., **9**, 1946, p. 186.) A "comfort chart," prepared by the American Society of Heating and Ventilating Engineers for air velocities of 15 to 25 ft. per minute, is reproduced, from which the relative importance of temperature and humidity may be determined. Ventilation equipment, dust collectors and their performance, and the use of air washers as air cleaners, are discussed with a view to their applicability in cotton mills. Cotton mill "fever" can be prevented by efficient dust and lint control.

334. Cotton Spinning Mill: Increasing Production per Man-Hour. By G. Dakin. (*Text. Wkly*, **37**, 1946, pp. 168, 240. From *Summ. Curr. Lit.*, xxvi., **5**, 1946, p. 101.) An address, presenting an analysis of possible measures for increasing "P.M.H." in cotton spinning, based on observations made by the Shirley Institute staff and others. The importance of the correct loading of the operative is stressed, and a note of caution is uttered about the extra cleaning and skilled supervision entailed by the omission of certain processes coupled with high drafting. A discussion is appended.

335. Views on Cotton Spinning. By F. P. Slater. (*J. Text. Inst.*, xxxvii., **1**, 1946, P1.) A report of an interesting lecture on cotton spinning, in which the subject is discussed under the following headings: The Cotton Fibre; From Cotton to Yarn; Cleaning Cotton; Mixing; Carding; Combing; Roller Drawing; Spinning; Quality *v.* Quantity.

336. Cotton Yarn Spinning; Influence of Ring Size, Bobbin Diameter and Spindle Speed. By A. N. Sheldon and J. J. Blake. (*Text. Mnfr.*, **72**, 1946, p. 13. From *Summ. Curr. Lit.*, xxvi., **4**, 1946, p. 79.) Charts have been developed from which may be predetermined the optimum diameters of ring and bobbin, and speed of spindle, for spinning yarn from any length of staple, carded or combed. The use of the charts is explained by application to specific cases, leading to the prediction of spinning costs under various conditions.

337. Cotton Waste Utilization. By F. Bentley. (*Text. Mnfr.*, **71**, 1945, p. 524.

From *Summ. Curr. Lit.*, xxvi., **3,** 1946, p. 49.) There are two main classes of cotton waste, yarn waste (from spun products) and soft waste (from preparatory processes in spinning), and two systems of waste spinning, the preparation system and the condenser system. The latter has two variations—namely, the Continental and the English systems. Opening and preparing processes and machinery are described, and the different waste spinning systems are discussed. The need for reorganization on modern lines in this country is stressed.

338. Some Instruments for the Analysis of Time Series, and their Application to Textile Research. By G. A. R. Foster. (*Int. Text.*, **3,** 1946, p. 116.) A recent paper read by the author, a member of the British Cotton Industry Research Association, before the research section of the Royal Statistical Society in London. Following on a description of "drafting," "floating fibres," and the "drafting wave" it is stated that the cotton sliver undergoes a number of drafting processes which exert considerable influence upon the nature of the final yarn. All cotton yarns are irregular, and in addition to irregularities arising from the presence of "floating" fibres in drafting, irregularities may be caused by random variations in the distribution of the fibres along the yarn, and by mechanical defects in the machinery. Can these be reduced to a formula, which can be employed in the definition of the strength properties of cotton yarn? These properties can be defined only by the complete relation between strength and specimen length, since the measured strength of a yarn decreases as the length of specimen broken increases. The variations in diameter of a cotton yarn are usually measured by passing it between a steel plate and a light steel shoe, which rides on the surface of the yarn. After magnification, the vertical movements of the shoe are recorded photographically. Several instruments have been evolved for the statistical study of such records. In the Grating Periodograph the curve, mounted horizontally, is illuminated by diffused light; in front of it is set up a grating consisting of a series of parallel equidistant vertical slits. Beyond the grating is a vertical ground-glass screen. This instrument enables the research worker to determine accurately the wavelengths of any waves which are perfectly regular in length and amplitude. It is especially useful for picking out waves caused by faults in the machinery. The drafting wave, however, is far from perfectly regular in length and amplitude, and for its analysis another instrument, the Correlation Periodograph, is needed. This instrument affords a means of measuring the wavelength of a drafting wave, with the aid of a photo-electric cell and a galvanometer. Another instrument, the Planimeter Integrator, performs the same operation mechanically. With the help of these instruments research workers have been able to discover the laws governing the change of wavelength and amplitude of the drafting wave, in relation to draft, roller setting, and variety of cotton; it has also become possible to compare these conclusions with those reached by theoretical studies of the fibre motion. In the latter process, the wavelength is related empirically to the draft, the roller setting, and the twist in the original sliver; these relations, when combined with theoretical calculations of the motion of the fibres, enable the amplitude of the wave to be calculated. The calculated amplitudes have been found to agree reasonably well with the actual measured variances of drafted slivers.

339. Textile Fibres: Physical Properties. By H. DeWitt Smith. (*Rayon Text. Mnthly.*, **26,** 1945, p. 271 *et seq.* From *Summ. Curr. Lit.*, xxvi., **1,** 1946, p. 9.) A comprehensive review of modern knowledge of the physical properties of textile fibres attained by "an engineering approach" to textile problems. The following data are assembled in tables and graphs: A list of the main textile fibres, the world production of them in 1938, and their uses; A comparison of the most ancient cotton (Gulati and Turner) with new cotton; Approximate dimensions of typical specimens of the chief fibres; the fundamental characteristics of fibres and of yarns; density and strength (dry; gm. per grex unit and lb. per sq. in.) of the chief fibres; a compilation of the important mechanical properties of textile materials, and a system of symbols and equations for the relationships between various units concerned in tensile behaviour; the effect of moisture on swelling and strength; the effect of temperature

on strength; the effect of rate of loading; the effect of fibre fineness on bending stiffness; effect of fibre shape on fibre stiffness.

340. Textile Machinery: Maintenance Control. By C. M. Bowden. (*Text. World*, **96**, 1, 1946, p. 121. From *Summ. Curr. Lit.*, xxvi., **9**, 1946, p. 185.) The problem of maintenance at a typical mill of approximately 35,000 spindles and 850 looms has been studied. The immediate objectives of the proposed programme are essentially: full information on maintenance results at each process, planned overhauling, unbiased machine inspection, and analysis of long-range results. A diagram is given showing how the manager organizes the lines of authority for maintenance control. Overhauling inspection forms and records of cards reclothed or any similar major maintenance item, have been developed. Records are also kept of tests on new devices or equipment, and of long-range analysis results obtained from maintenance and other activities. Maintenance control directly improves machinery operations and indirectly benefits quality and costs.

341. Pressley Cotton Fibre Strength Tester: Critical Study. By S. Williams and E. V. Painter. (*Text. Res. J.*, **15**, 1945, p. 403. From *Summ. Curr. Lit.*, xxvi., **5**, 1946, p. 106.) After making thousands of tests in the laboratory of the National Cotton Council of America with the Pressley tester it was found impossible to duplicate the results noted by Pressley. Factors influencing the accuracy of results have been studied. The tester and the method are described. Data on the effects of machine difference, operator difference, sample size, bundle weight, bundle width, time of day, and of worn jack screws on Pressley Index values are tabulated. From the results obtained in this study it seems highly advisable not to rely upon data obtained from one machine alone. There is need for a rigid check on the mechanical condition of the tester if it is to yield the most useful and accurate data.

342. Shirley Analyser: Application. By G. W. Pfeiffenberger. (*Text. World*, **95**, 11, 1945, p. 127. From *Summ. Curr. Lit.*, xxvi., **4**, 1946, p. 79.) The Shirley Analyser, for determining trash in raw cotton, is described, and results of tests conducted in connection with the research and testing programme of the U.S. Dept. of Agriculture are reported. The Shirley Analyser removes practically 100 per cent. of foreign matter in cotton lint, and is, therefore, recommended as a means of studying the cleaning action of machines up to and including the card, and especially for determining the proportions of clean cotton and trash in card strips and the like. Examples are given.

TRADE, PRICES, NEW USES, ETC.

343. World Cotton Supply and Consumption, 1939-45. U.S. Dept. Agr. (*Text. Wkly.*, **37**, 1946, p. 162. From *J. Text. Inst.*, xxxvii., **4**, 1946, A141.) Statistics are tabulated of the supply of American and other cottons and consumption in American and other mills from 1939 to 1945, and the outlook for 1946 is discussed.

344. British Cotton Industry: Development. (*Economist*, **149**, 1945, p. 943. From *J. Text. Inst.*, xxxvii., **3**, 1946, A137.) Discusses the post-war prospects of the British cotton industry, the labour problem confronting the Working Party, and the need for rationalization.

345. British Cotton Industry: Policy. By W. Sefton. (*Economist*, **150**, 1946, p. 100. From *Summ. Curr. Lit.*, xxvi., **5**, 1946, p. 115.) The view is expressed that mass production of cotton textiles in Great Britain would cause disaster to the industry. This country, with a small population, and depending on exporting to the world what it wants, must cater by constant variety for a multitude of individual and varying tastes. Any reform of the cotton industry must leave the individuality of the trade intact.

346. British Cotton Industry: Reconstruction. By W. A. Grierson. (*Text. Wkly.*, **37**, 1946, pp. 108, 120. From *Summ. Curr. Lit.*, xxvi., **5**, 1946, p. 115.) A report of a lecture on the following measures for the rehabilitation of the cotton industry: Provision for the liquidation of surplus capacity; "long runs" to enable

expensive machinery to be operated economically; agreement to run machinery the maximum number of hours in order to spread overhead charges and depreciation; assurance that labour can be employed economically by known modern methods; and sanction by Government of adequate provision for depreciation in all fixed margins. Evidence in support of the suggestions is given, principally by citing American "P.M.H." figures.

347. LANCASHIRE COTTON INDUSTRY: PROBLEMS, PROSPECTS, AND POLICIES. By W. H. Slater. (*Text. Wkly.*, **36**, 1945, pp. 880, 936. From *Summ. Curr. Lit.*, xxvi., **1**, 1946, p. 19.) A report of an address reviewing current proposals for the better organization of the cotton industry. A brief discussion is appended.

348. COTTON GRADING AND MARKETING. (*Fortune*, **32**, 1945, 5 *et seq.* From *Summ. Curr. Lit.*, xxvi., **9**, 1946, p. 179.) The complex interrelations between economic and engineering factors in profitable merchanting of raw cotton include many problems of mechanization in handling and processing and of instrumentation in evaluating quality. Round bales, which had some technical merits and demerits, were abandoned, largely for economic reasons. Emancipation of cotton grading from the human factor is expected to come largely through photo-electric instruments.

349. COTTON APPRENTICES: TRAINING. By W. E. Spain. (*Cotton*, U.S.A., 109, **6** and **7**, 1945. From *J. Text. Inst.*, xxxvii., **2**, 1946, A80.) The Apprentice-Training Service of the War Man-power Commission has studied the possibilities of broader training through apprenticeship in the textile industry. With the card-room group as a base from which all-round work experiences could be developed on a departmental level, each fundamental department of a typical mill was studied, resulting in six fields being circumscribed, each of which had sufficient requirements to warrant development of adequate apprenticeship standards. The six occupations are: card room mechanic, spinning room mechanic, warp preparation mechanic, weave room mechanic, mill machinist, general maintenance mechanic. Schedules of work experience have been established and apprenticeship terms laid down. The training experiences have been divided into four phases: (1) operative, (2) maintenance, (3) adjusting, and (4) repair and overhaul. Standards of apprenticeship are set out.

350. COTTON OPERATIVES: MANAGEMENT. By Rev. A. D. Johnson. (*Text. Wkly.*, **37**, 1946, p. 180. From *Summ. Curr. Lit.*, xxvi., **6**, 1946, p. 142.) A report of an address by a clergyman who has had contacts with cotton operatives over a long period of years. He puts forward suggestions for improvement in working conditions, especially with regard to prospects. There should be educational courses for operatives leading to the *profession* of management, and classes for women leading to posts of responsibility.

ADDENDA.

351. EGYPTIAN COTTON (*Cotton*, M/c, 29/6/46.) The Alexandria Commercial Co., in their report for June, state that the "Spot" market kept moderately active and the average daily turnover of business was regular, though smaller in volume than the previous month. The variety which attracted most attention was Ashmouni, mainly for grades Good up to Fully Good, but prices were somewhat easier. Karnak came next, grades Good to Fully Good being mostly in demand at prices more or less unchanged. Small quantities of Giza 7, Sakel, Menoufi, and Malaki also changed hands. New export sales were smaller in volume. India bought moderately, and a few sales to Continental countries were also registered. The French Buying Delegation bought 60,000 bales of which 10,000 bales were Karnak.

Normal progress of the growing cotton crop is reported from all districts. Climatic conditions are favourable, water supply is on the whole adequate, and attacks of cotton worms are mild and kept well under control.

352. CHINA: REPORT OF THE NATIONAL AGRICULTURAL RESEARCH BUREAU, MINISTRY OF AGRICULTURE AND FORESTRY, 1932-44. (Sino-British Co-operation Office,

19/4/45. From *Pl. Bre. Abs.*, xvi., **2**, 1946, p. 144.) Cultural data indicate that the distinct cotton-growing regions of China are the Yellow River Valley, the Yangtze Valley, and the south-western area. Stoneville 4 is best adapted to the Yellow River Valley and Delfos-531 to the Yangtze Valley; Coker's 100-2 and Foster-6 are most suitable for the south-western region. Two new strains of Delfos-531 (24-424 and 24-1099), produced by pure line selection, have shown superiority over the original material in yield and staple length. A hybrid strain, Chickenfoot Delfos, has been obtained which combines the narrow-lobed insect resistant leaves of Chickenfoot and the yielding capacity and qualities of Delfos. The Yunnan perennial cotton has been found to be related to *Gossypium peruvianum*; this cotton is now grown extensively in Yunnan. An Asiatic cotton of the African type (*G. herbaceum*) has been discovered in Kansu. In a study of factors determining yield negative correlation has been observed between number of bolls and the percentage of boll locks. Growth studies of eight Chinese and ten American Upland varieties have been carried out at Siuning, Szechuan. For several years the inheritance of anthocyanin pigmentation in Chinese cotton has been studied. By 1942 another four gene pairs were added to the original total of fourteen. The genetics of three types of yellowish-green seedlings and two types of leaf form occurring in American cotton have been analyzed.

353. AN INTRODUCTION TO INDUSTRIAL MYCOLOGY. By G. Smith. (3rd Edn. Edward Arnold and Co., Ltd. London, 1946, 20s. net. From *Nature*, 15/6/46, p. 786.) The earlier editions of this useful book were remarkable for the clarity and quality of the photomicrographs. They are still better in the third edition, and seven more have been added, while four "which were not considered satisfactory," have been replaced. This results in an even more useful volume. It serves alike as a readable introduction to micrological technique and literature, and a work of reference for the specific uses of mould fungi in industry. The text has only been changed in detail, as war-time restrictions were still in force when it was revised. It must be left to subsequent editions to describe many of the interesting problems involving the activities of moulds which have arisen in various industries during the war years. (*Cf.* Abs. **404**, Vol. XX. of this Review.)

ERRATA.

THE CRINKLED DWARF ALLELOMORPH SERIES IN THE NEW WORLD COTTONS. By J. B. Hutchinson. Vol. XXIII., No. 1, p. 74; lines 28 and 42, read **cr^D** in both cases.

EVIDENCE ON CHROMOSOME HOMOLOGY AND GENE HOMOLOGY IN THE AMPHIDIPLOID NEW WORLD COTTONS. By R. A. Silow. Vol. XXIII., No. 1, p. 75; line 9, read R_2.

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THE SHIRLEY INSTITUTE—IN PEACE AND WAR

BY

F. C. TOY, D.Sc.

READERS of this Review may be interested in a brief account of the Shirley Institute and its activities both in peace-time and during the war years.

Situated at Didsbury, Manchester, the Institute is the headquarters of the British Cotton Industry Research Association, which was formed in 1919 to carry out—as its name implies—research into the problems of the British Cotton Industry. Since that time its scope has been very much expanded, first by the setting up of a rayon department in 1928, then by the formation of a department for natural silk in 1936, and latterly by research on all synthetic fibres of interest to the Lancashire textile industry. The Silk Department took over and extended the work previously carried on at Leeds University by the British Silk Research Association, and researches on rayon and other synthetic fibres have long since overflowed from the original Rayon Department, until today many of them are inextricably mixed up with our work on the natural fibres, and cotton in particular.

British firms engaged in processing cotton and silk or in producing and processing synthetic fibres, or in the manufacture of textile machinery, are eligible for membership, and the majority of such firms are now linked with us in this way. There is also a limited form of membership open to certain other sections of the textile industry.

The industrial income of the Association is derived from various sources, chief amongst which are the Cotton Board (the Central Authority for the trade), the Cotton Trade War Memorial Fund, the Empire Cotton Growing Corporation, individual firms and trade Associations. The total from all these sources at present amounts to about £135,000 per annum, and to this must be added a Government grant, the amount of which depends on the industrial income and was £80,000 in our last financial year.

The controlling body of the Association is the Council, which consists

mainly of eminent business men, some of them representing important trade associations. Research policy is determined by a Research Committee, and the detailed research programme by various scientific and technical sub-committees, on which serve technical experts from the different sections of industry, spinning, weaving, bleaching, dyeing, and so on. Thus the textile industry itself controls the activities of its central research organization.

The staff of the Institute grows steadily, and including all grades is now approaching four hundred. About eighty of these are graduates of various Universities; most of the remainder are divided between ancillary laboratory staff, operatives, engineering staff, clerical workers and liaison personnel. All these grades are necessary to deal with the various aspects of our work today, fundamental scientific research, applied research of a technical nature, design and construction of new instruments and machinery, close and frequent contact with our members in the mills, efficiency surveys of mill processes, and so on. Our fundamental work has as its objective simply the accumulation of more knowledge of the materials used in the industry—cellulose, starch, dyestuffs, etc.—and of the interactions between them, and the workers in this field are free to follow the trail wherever it may lead them. Applied research is devoted to specific objectives, such as the improvement of drafting in spinning or of the mechanism of the loom (what room for improvement there is in both of these!). The skill of the engineer may be wanted to build new instruments based on new methods of testing textile materials, or to build full-scale prototype textile machines incorporating new principles. And in addition to all these activities the trade must be made more aware of what we are doing and why we are doing it, and this is where the Liaison Department comes in. The staff of this department are all men familiar with mill practices who are quite "at home" with the managements and are able to appreciate their outlook on things. All these various groups of workers, with such different occupations, make up the full research team, and all have a common objective in the fullest possible application of science and scientific methods to the industries we serve.

When the war broke out in 1939, the Council of the Association decided that the full facilities of the Institute's laboratories and workrooms should be freely placed at the disposal of any Government department requiring the assistance or co-operation of the Institute, but that, with this proviso, fundamental scientific research should be continued as far as possible under the circumstances. It was felt that to stop such research completely would place the industry under a severe handicap in later years, and actually it decreased gradually as work for the Services and other Government departments made inroads into the time and labour available.

Contacts with different Government departments steadily increased as the war progressed, and these involved the giving of advice on a wide range of problems, conducting special investigations, and supplying apparatus and reagents for use in Government laboratories. Some senior members of the staff were seconded to Government departments as temporary civil servants, in particular to the Ministry of Supply, Ministry of Aircraft Production, the Admiralty and the Ministry of Production. Others served as members of various committees to consider and advise on difficult and urgent problems, whilst three members of the staff have been on extended missions to the United States.

In October, 1940, the Cotton Controller (Ministry of Supply) summoned a meeting at the Shirley Institute of representatives of the Admiralty, Ministry of Aircraft Production, Ministry of Supply, and War Office to discuss recommendations by the Association for the overhaul and revision of the official specifications for cotton cloths, these recommendations being later largely adopted.

Many of our contacts with Government departments have involved experimental work, some covering a wide range of problems. For example, the Association was represented on the sub-committee on clothing for the fighting forces, convened by the Military Personnel Research Committee under the ægis of the Medical Research Council. This sub-committee dealt with a large number of problems, many of which were the subject of research at the Institute. Some of the problems relating to clothing for specialized troops led to the development and application of the fabrics called "stormproofs." The stormproof fabrics are part of a range of close cotton cloths which have been designed at the Institute and which represent an application of the knowledge of the relationship between fibre, yarn and cloth properties gained during the past twenty years. The cloths are so constructed as to have a high degree of water resistance and to become water-tight when wet. All-cotton hosepipes and water-holding canvases were designed and manufactured and, when the war situation led to a shortage of flax, the cotton canvases had important industrial and Service applications for dams, tents and covers. The extension of the idea to garment-weight fabrics was logical. The stormproof fabrics that have been designed have advantages over the more usual gaberdines in so far as they have a much higher wind and water resistance and give effective protection in long exposure to heavy rain, and also over impermeable coated materials in so far as they are more serviceable and comfortably permeable to perspiration. Fabrics of this type have been used for the clothing of Service personnel on Arctic convoys and for troops stationed in the Arctic, for tank crew overalls and for convoy fighter pilots' immersion suits. This latter application is of particular

interest in that it represents practical success in the severest demand made on a stormproof fabric—its use for making an immersion suit capable of keeping a man dry in the sea for appreciable periods while making for a dinghy, or waiting to be picked up.

The problem of substitution (almost overnight) of one material in short supply by another which was available was continually with us, and reflected the progress of events in the various theatres of war. In the early stages of the war, for example, restrictions had to be placed on the use of American cotton. One investigation entailed the re-designing of the structures of a wide range of cloths so that use could be made of the greatly different Egyptian cotton and also of a wide range of yarns spun previously from Egyptian cottons for civil requirements. As the war progressed this policy was reversed, Lease-lend came into operation and American cotton had frequently to be used for purposes which, in peace-time, had normally been met by the use of yarns spun from Egyptian cotton.

Fresh problems continually arose as bulk purchases of cotton were made by the Cotton Control. Stocks of cotton were brought from different places according to the ever-changing shipping facilities, or in accordance with economic considerations. The Institute carried out tests to determine the fibre and yarn characters of the crops of different countries, some of which had rarely before been used in Lancashire. Spinning firms, engaged either on civil or Service contracts, in some cases also approached the Institute directly for advice on the behaviour of cottons which they had not spun previously.

The Association was represented on committees dealing with the development of ammunition textiles and the consideration of rubber alternative materials for tyres and treads. The work in connection with this second problem is interesting, because experimental work was done on the use of cotton as a substitute tread for existing pneumatic car and cycle tyres. In collaboration with member firms and tyre companies, cotton and cotton/rubber treads were developed with a life of some thousands of miles. Whether production facilities for such tyres could ever have been found is another question!

The Association was represented on a Ministry of Supply committee set up to consider kapok substitutes for flotation purposes, and was responsible for reports on the fundamental nature of the buoyancy of fibre masses, on the buoyancy of differently opened and packed kapoks of different origin, and on the buoyancy of different kapok substitutes, and these reports largely determined the decisions of the committee. This is an excellent example of the application to one fibre of fundamental scientific methods and knowledge based on research on other fibres.

The Association was represented on the Ministry of Supply Textile

Rot Proofing Panel and also on the sub-committees dealing with testing sewing threads and webbings, canvases and covers, mosquito netting, and yarns and fabrics for electrical purposes. On the basis of earlier mycological work and as a result of more recent research on the causes of decay of textiles exposed under various conditions, allied with increased knowledge of the chemistry of the different natural fibres and of the action upon them of chemical agents and micro-organisms, the Association was able to give advice and make recommendations relating to the incidence and control of mould and bacterial attack on textiles. These recommendations were largely adopted and applied in the mildew and rot-proofing of textile materials destined for the Far East. In this connection a large amount of work was done on the practical application of the proposals, on the testing of materials and on the development of methods of testing and analysis.

The Rayon section of the Association was represented on the Ministry of Aircraft Production committee dealing with substitutes for silk yarn for electrical insulation purposes. It was also concerned with experimental work in connection with the winding, sizing, weaving and finishing of nylon for parachute fabric. Representatives of the Association attended meetings to discuss and specify the construction particulars, finishing details and testing conditions of Utility cloths, and have acted in an advisory capacity to the Board of Trade and the Cotton Board on problems relating to the Utility cloth programme and on complaints regarding Utility cloths and garments. In association with the National Physical Laboratory a test for estimating the efficiency of black-out fabrics was developed and applied in the examination of over 7,500 samples for compliance with specification.

The Association developed methods of testing and acted as referee in assessing price-quality schedules of cotton yarns for the Ministry of Supply (Cotton Control) when establishing price control regulations, nearly 1,400 samples being examined. It also developed methods for testing the content of foreign matter in cotton felts for bedding and upholstery, and tested nearly 500 samples.

The Institute also played a part in economic warfare by examining and reporting on many textile articles, especially materials used in captured enemy equipment. This work provided a check on the supply position of raw textile fibres in enemy countries and also on whether it was being found necessary to lower the quality of the various products.

These illustrations will give some idea of the range of our contributions to the war effort, which involved altogether some 1,000 contacts with departments of our own and allied Governments. All the work was done without any charges, which, had the work been costed, must have amounted to tens of thousands of pounds. But money isn't every-

thing, and we look back on the part we played with pride and satisfaction.

Many examples could doubtless be given of the wisdom of the Government's decision in 1939 to reserve existing research teams and not let them break up in the early days of the war, and I think not least amongst such illustrations would be the record of our service to the nation during those long and anxious war years.

Received August, 1946.

A TEXTILE TECHNOLOGIST IN THE COTTON FIELD—II

BY

E. LORD.

Shirley Institute, Manchester.

After seeing the flowering and early bolling stages of the Sakel crop in the Gezira, arrangements were made for me to visit Uganda before returning to the Sudan to observe the picking, grading and ginning. The journey southwards was broken at Juba to make a short, rapid tour in Equatoria, the southernmost province of the Sudan. The principal town is Juba, on the western bank of the White Nile, or Bahr el Jebel, as this stretch of the river is usually termed. From Khartoum to Juba is about a thousand miles, and the journey usually takes about a fortnight, travelling by rail as far as Kosti and then by river steamer up the Nile. By air, however, the length of the trip has been reduced to only half a day.

The plane set off from Khartoum before dawn, and as it circled about the aerodrome to gain height, the town below appeared like a sheet of illuminated graph paper, with the verticals and horizontals traced out by lines of twinkling street lamps. For the first hundred miles or so the plane followed a course parallel to the White Nile, but little could be seen of the view in the dim light and mist of the morning. The river was afterwards left behind and, although the sun soon rose, there was very little to see as we flew over the semi-desert region of Eastern Kordofan. The only prominent feature observed on this part of the trip was the Kosti-El Obeid stretch of railway line. The plane approached the river again at Malakal, the centre of the Upper Nile Province. After a short stop we continued on over the desert to Juba, where we landed in time for lunch.

Equatoria is the most backward province of the Sudan, and it is only in recent years that active steps have been taken to develop its economic resources and effect social improvement of its indigenous people. Cotton growing was started there about twenty years ago, but the crop has never been very large. In the eastern zone the natives showed little inclination to grow cotton, the relatively small areas suitable for its cultivation became gradually exhausted, and in 1942 the lack of transport and the need for increased food crops finally caused the Government to abandon encouragement of this crop.

In the western areas there has always been a greater interest displayed in raising cotton as a cash crop, although even here considerable Government persuasion was needed. The land most suitable for

cotton runs along the southern border of the Sudan, in a strip some thirty to sixty miles wide. It starts in the neighbourhood of Yei and stretches through Meridi and Yambio to the district around Tambura, near the junction of the borders of the Belgian Congo, French Equatorial Africa and the Sudan. This zone is about 2,500 to 3,000 feet elevation, and is a long grass area of the savannah type with extensive stretches of wooded country.

We left Juba shortly after lunch and travelled by lorry to Kagelu, a few miles beyond Yei. During the war this road was an important line of supply for Allied forces acting in the Sudan and in neighbouring operation zones. For this purpose the road was widened and many gangs of natives worked to maintain it for the use of heavy army convoys. In this region there is a hard red laterite formation lying just below a thin cover of soil. This ironstone provides a firm foundation and surface for the road, which was in excellent condition as judged by African standards and might even be classed as C3 in England.

In the first few years following the introduction of cotton into Equatoria, an appreciable quantity was grown around Yei. It was not, however, an entirely successful crop, nor was it greatly favoured by the native cultivators. Eventually the ginnery at Yei was closed, cotton meanwhile extending westwards. The Sudan Government still maintains an agricultural station at Kagelu, and much valuable work is being done on fruit trees and general husbandry. An important function of the Kagelu station is the intensive instruction in agriculture obtained there by interested natives, many of whom later become agricultural instructors in villages over a wide area.

Next day we left Kagelu and travelled along a road branching off from the main highway at Yei and leading on to Meridi. About halfway to Meridi blacker soils begin to displace the redder soils of the Juba-Yei area. Cotton growing in Equatoria is at present mainly centred around Meridi, where a ginnery has been erected. Government propaganda directed towards increasing cotton production was stopped during the war, but seed continued to be available and small crops were still raised. Steps are now being taken to increase its cultivation again.

A comprehensive scheme has been started to develop the Zande area, with the ultimate aim of making this stretch of country, running from, roughly, Meridi to Tambura, into a self-contained unit. The plan envisages that most of the requirements of the people will be met by local production, selling products outside the area only on a scale sufficiently large to raise funds for the purchase of necessities not produced locally. New cotton-growing areas have been started around Yambio and these will be extended through to Lingesi and westwards. Lingesi itself is designed to be the industrial centre of the Zande region.

It is proposed to erect there a spinning and weaving mill, sufficient to meet most of the cloth requirements of Equatoria and also to produce some material for sale in the northern and central parts of the Sudan. In addition it is proposed to make use of surplus cotton seed by extracting oil and manufacturing soap, and to erect a saw mill for the adequate development of forest products.

At Meridi we saw the experimental farm run by the Agricultural Service. On the cotton side the most interesting point was the good performance in trials shown by the SP 84 (REST) strain, the blackarm-resistant cotton developed for growth in the Nuba Mountains, where it may possibly displace the present commercial Pump Scheme Strain. Seed maintenance and multiplication of American-type cotton in the Sudan will be greatly simplified if one strain of cotton is found suitable for general growth in the different rainfall areas.

In the morning we carried on to Yambio, the present administrative centre of the Zande area. In the evening we visited the experimental farm, and on the following day went round a number of group farms in the district. In this newly-developed cotton region the SP 84 (REST) variety was being grown: the crop was giving a good yield of excellent white lint of high grade. The high grade was largely due to absence of stainers in the crop, but the native instructors are setting a very strict standard in the sorting of the seed cotton for removal of soiled and damaged locks. Although the standard adopted for this sorting will prove too high to maintain when the crop increases in size, it is much better to aim high and then fall, than to start low and finish even lower.

Now that the area is being developed according to a balanced scheme, more attention is being given to the problem of establishing permanent cultivation. This applies especially to the newer areas around Yambio, and the group farms there are a trial with this object in view. Holdings are to be cultivated on a ten-year rotation. The ground is first prepared by burning and clearing and then a food crop is planted, followed by cotton in the second year and another food crop in the third. The land will then be allowed to revert to bush fallow for seven years. In this way the soil is not exhausted before cropping ceases at the end of the three-year period, and the long resting period is expected to maintain fertility. Soil erosion, encouraged by the continuous cropping previously practised, will be avoided by the adoption of the shorter period under cultivation and by making the plots in the form of strips following the contours, with bands of permanent vegetation between the neighbouring cultivated strips.

One reason why cotton was viewed unfavourably in the Zande country was that the picking of the crop was often as late as the end of January, or even early February. This period coincides with the

season for hunting and also the collecting of wild honey. Early planting of cotton is being urged and the practice of intercropping with groundnuts is being tried, the latter also encouraging the early sowing of cotton because the cultivator naturally pays most attention to his food crops. The earlier sowing of cotton has the advantage of making greater use of the rains as well as leaving the native free for hunting in January. It would also make possible the uprooting of old cotton sticks at an earlier date, and provide a much longer and more effective close season for controlling pink bollworm.

The scourge of sleeping sickness throughout this area made it necessary for the Government to insist upon the people living within sight of a main highway so that control and inspection could be easily enforced. Although this danger has decreased, most of the villages are still strung out along the main Yambio-Yei road, and only a few diversions were possible on the way back.

A novel feature for me was our passage through countless bush fires. Some were small, but others were quite large and swept across the countryside. Some of the fires were accidental, but many had been lit to clear the wilderness of old dry undergrowth. At Meridi we stayed overnight with the Inspector of Agriculture. His house is on the summit of a large hill, commanding a view of the country in all directions. At night we were surrounded by dozens of these bush fires, stretching southwards to the Belgian Congo border at the top of the watershed and northwards for even many more miles. The bright red glare in the sky, the flickering flames below and the shifting palls of smoke were all too reminiscent of familiar " blitz " nights at home some time ago.

Passing through Yei, a Sudan official asked us about the condition of the road which we had just traversed, and appeared not only surprised but disconcerted to find that none of the crude bridges had collapsed under the weight of our lorry. On reaching Juba, having covered the cotton area in six days, we felt rather like hustling American sightseers. But our backs felt like raw meat after having been pounded without rest against the hard wooden back of the lorry. It was with a feeling of relief that we set off on the quiet leisurely five-day journey to Kampala in Uganda.

On this journey we sampled several forms of transport and could certainly not complain about lack of variety. We left Juba on a Saturday morning and first went by road to Nimule, on the Uganda border. It was on this stretch of road that I had my first glimpse of giraffes outside iron cages. At Nimule we boarded the river steamer s.s. *Lugard*, a curious vessel to my eyes, since it had square bows and pushed half-a-dozen cargo barges in front of it, instead of towing them as all respectable vessels do at home. Our slow and placid progress upstream was disturbed only by occasional shots which the captain took

at crocodiles basking in the sun on the banks of the Nile. Once or twice we passed schools of bulky hippos, with their fat pink offspring snorting playfully around in the water. To my great satisfaction we came across small herds of elephants feeding beneath trees on low hillsides rising above the general level of the papyrus-covered river plain. On one of these occasions the captain let fly at one of his crocodile friends. The noise of the gun startled a group of five adult elephants and they bolted in terror, lumbering across the ground at a rapid pace, surprising for animals so large.

Rhino Camp was passed during the night and on Sunday afternoon we arrived at Pakwach, where we stayed for several hours. Later in the evening we changed into a river launch, the *Murchison*, and continued our way upstream. There were only three passengers on the *Murchison*, and we each had a cabin to ourselves, or so I first thought. This I later found to be a mistake, because in the morning I found that several affectionate visitors had left strong impressions upon me—nice round pink marks which lasted for over a fortnight. During the night we entered Lake Albert and proceeded along the eastern bank, arriving at the small port of Butiaba in time for breakfast. Later we went by road to Masindi and, after staying there overnight, continued in the morning to Masindi Port on the Victoria Nile. This interlude by land is necessary to avoid the impassable Murchison Falls, where the Nile tumbles down a steep escarpment from the main Uganda plateau to the plain of Lake Albert below.

The river steamer s.w. *Stanley* now took us up the Victoria Nile, and through Lake Kioga. This lake is one of many arms of swamp and papyrus, and sprawls across the centre of Uganda like an untidy octopus. At last, on Wednesday morning, we arrived at the river port of Namasagala, the terminus of one of the branches of the Kenya-Uganda railway. From here we travelled in first-class state to Kampala, in a compartment of the eight horses, forty men type which appeared to have been designed by Stevenson.

During my stay in Uganda, Kampala was used as a base from which I went out to see something of the different zones in the country. As a complete newcomer to cotton growing, the joint tour of Sudan and Uganda proved to be a most useful introduction. In the Gezira I was able to see how irrigation had transformed a most unpromising barren land into a fertile tract now producing cotton considered by many spinners to be equal to, if not better than, the best bulk crops of Egypt. Here in Uganda there is, of course, no irrigation, but the country grows the best bulk crop of American cotton raised under rainfall conditions in Africa. In the Nuba Mountains of the Sudan the rainfall is small, and, although some soil erosion occurs, it does not yet constitute a major problem. The people are relatively few, and there are still other lands

to which they may move when soil fertility declines to an unprofitable level. In many of the best parts of Uganda, especially in Buganda, there is a dense population and land is now relatively scarce. Over-cropping needs to be avoided to escape the twin evils of erosion and loss of soil structure. High quality cottons give good yields of excellent lint on the best lands, but this is attended by economic difficulties. The necessity for maintaining purity in seed stocks entails that seed distribution must be made over large zones. Complete chaos would follow if owners of good land received high quality planting seed whilst a lower quality was issued to cultivators of poor tracts nearby. On the other hand, the demands of the spinner for uniformity of lint character increase as quality becomes higher. Variations normally accepted without question in poor cottons are not tolerated by users of high quality cottons. Breeders in Uganda have developed excellent cottons which give an adequate yield in the best zones of the country. They are, however, faced with the difficulty that these high quality cottons when grown on nearby poor tracts within the zones, although giving a lower yield, should preferably show as small a decline in lint quality as is consistent with the various practical economic considerations. A mixture of good and poor quality within lots of nominally the same high-class cotton from one district needs to be avoided. The developments in this direction, both those which have already been made and others still necessary, may be gauged by the relative demands for the different cottons grown in the various zones.

I naturally spent a considerable part of my time at Kawanda, only a few miles out of Kampala. The Kawanda experiment station and farm is designed to cover the needs of the western half of the country. Here for the first time I saw growing the various strains of cotton with which I had long been familiar on account of their having been sent in the past to the Shirley Institute for fibre and spinning tests. As mentioned in the first section of this article, it is not proposed to give any critical outline of all the many projects being tackled: that may easily be found elsewhere. Nevertheless a passing general mention might be made of some of the material, especially in relation to the commercial crops in the different zones.

Whilst in Uganda a short trip was made to the Masaka region. Here we stayed at a hotel at Kiwala, some four miles or so east of the town of Masaka. This hotel was built at the edge of a steep cliff, where visitors could obtain a magnificent view over Lake Nabugabo and Lake Victoria beyond. In this region we saw the last surviving portion of the once large crop of the old ARK style of cotton. It was cotton of this type which first founded the reputation of Uganda as a producer of high-class American cotton.

The ARK mark of cotton is grown from the seed stock known as

"Buganda Local," formerly cultivated throughout the whole of Buganda. This cotton is derived mainly from the large introduction of Sunflower seed from America in 1916, but also contains traces of earlier cottons as well as some of the N17 type. Buganda Local is a welter of genetic types of very diverse character, containing a wide range of seed types from full fuzz to completely naked, including both white and green fuzz. Some of the plants are of good habit and yield, with lint of satisfactory quality: others are just the reverse. This crop provides the breeder with a haven of delight or an awful nightmare, according to whether he is looking for an interesting source of breeding material or is rapt in thoughts of a "pure strain." Viewed objectively as a commercial cotton, the ARK crop is a very useful type and would still appeal to many spinners requiring a good "bread and butter" cotton better than many of the crops from elsewhere in Africa and America. It is not anticipated that many seasons will pass before the last remnant of this old Uganda cotton is displaced by a more recent type.

Already, of course, ARK cotton has been replaced over the whole of Buganda by the long fine BP52 variety. This was seen growing under many conditions on tours made through some of the main areas, in Kyagwe, Bulemezi and Singo. Typical Buganda country consists of many flat-topped hills, with their heights on the level of the old original Uganda peneplain. Between these hills are intervening valleys, on the sloping sides of which are many cultivated stretches. The dark marshy soils at the bottoms of the valleys are generally of lighter character, and less fertile than the hillsides, and agriculture is often avoided. This "elephant grass zone" in areas west of the Nile is usually capable of growing good crops, but I saw many illustrations of problems which the Department of Agriculture is striving to overcome. Continuous cultivation strips off the natural protection from the land: the heavy rains lead to loss of soil structure and this often results in soil erosion. Many of the fields bore a striking appearance: good crops from the lower slopes and poor crops, sometimes virtually none at all, from the upper levels where the best soil has been washed away. In some cases holdings have been continuously under cotton for as long as five to seven years. The effects of this upon yield and quality may be easily imagined. It is this type of peasant cultivator that the Inspectors of Agriculture are trying to educate in the ways of good husbandry, for whom the soil scientists are busy developing the best methods of soil conservation and regeneration, and for whom the breeders are trying to develop strains of cotton suitable for varied conditions.

It was whilst out one day in Bulemezi that my little Sudan gremlin cropped up again. When some sixty miles from Kawanda, the front pair of wheels of our car decided to part from their shackles and joyfully wander up and down the main springs, with results disastrous to both

steering and brakes. We eventually became tired of following a zig-zag course and decided to see what our repair-kit would yield. Finding nothing suitable we at last hit upon a happy solution. The floating pair of wheels was anchored to the front bumpers by a strip of two-inch canvas webbing, and this enabled us to complete our homeward journey, if not in style, at least in comparative safety.

A fairly extensive tour was also made in the so-called "short-grass region," the Eastern Province. First we covered most parts of Busoga, the area bounded on the north by Lake Kioga, on the south by Lake Victoria, west by the Victoria Nile and stretching eastwards to Budama in the Central or Bukedi zone. Busoga presents a wide range of conditions. Along the Nile and near to Lake Victoria the general type of country is similar to that in Buganda. Eastwards, and northwards to Lake Kioga, the poorer short grass country is entered.

Busoga produces the N17 type of cotton, which is also grown largely in Teso, and in Lango and Eastern Acholi. N17 and SG29 are two rather similar cottons, derived from Nyasaland Upland many years ago, and once grown throughout all eastern areas. At one time it seemed as if SG29 would displace N17, but a few years ago the trend reversed, and now SG29 has completely fallen out of cultivation. The N17 variety resembles a typical good long-staple type of cotton grown in the better parts of America. Many Lancashire mills prefer it to the longer and finer BP52 cotton, finding it easier to use in their mixings with American and Brazilian cottons of not greatly inferior staple length.

We continued onwards through Budama to Tororo and then northwards through other parts of the Central zone. Over all this region the SG29 variety has been displaced by BP52. The soils are very much poorer here than in Buganda, and this, with the lower rainfall available for plant growth, generally results in lower yields and cotton of poorer quality. Partly on account of this difference in character of the cotton, the Central zone crop, and also those of Bunyoro, West Nile and Western Acholi, appear on the market under the old zone marks BKD, BRO, etc., instead of being sold as BP52. The only cotton grown from BP52 seed and sold as BP52 is that grown in Buganda.

In Teso we stayed at Serere, at the experiment station serving the requirements of the "short grass region." Here we saw the N17 cotton growing in the Lake Kioga type of country under conditions much poorer than in southern Busoga. Around Soroti the B181 variety is being grown on an increasing scale. It is displacing N17, not on account of better quality, but because it gives better yields.

In the north-east part of Teso is the Usuku area. Here is grown the SP84 variety, from the seed of which was sifted out the blackarm-resistant component now on extensive trial in the Sudan. The crop in Usuku is much earlier than that of the main Teso crop. Picking was

over when the area was visited, but sufficient was seen of the poorer conditions prevailing here to emphasize the need for it to receive special consideration in the country's agriculture.

There is not sufficient space to dwell upon the many other problems which deserve, and which are receiving, attention in Uganda. There is a large programme of work in progress designed to develop resistance to blackarm and other diseases. Insect pests are receiving a great deal of attention, and many workers in Uganda go about muttering "Lygus." That pest, which can extend cotton plants into ten-foot raspberry canes carrying but one cotton boll, causes many more headaches than ever aspirins can cure.

I left Uganda full of amazement at the heavy amount of work which is being carried out by a depleted staff. That fundamental research into a wide range of problems, and also much work on crops other than cotton, can be fitted in with the many urgent investigations needed for the main crop, speaks volumes for their industry.

After returning to the Sudan for a further short stay, I finally left for England. Thanks to the everlasting patience of all with whom I came into contact, to their kind submission to my continuous barrage of questions, I feel that I have gained at least some slight conception of the many and complex difficulties which beset a breeder and grower of that obstinate plant called cotton.

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"FURTHER OUTLOOK UNSETTLED"

METEOROLOGICAL AND OTHER NOTES, 1940-45

BY

R. C. RAINEY, A.R.C.S., B.Sc., Ph.D.

Empire Cotton Growing Corporation, South Africa.

One morning in January, 1941, an overloaded 15-cwt. truck emerged cautiously from a narrow defile in the Labur massif on to the sandy flats bordering Lake Rudolf, and halted a mile or two further along the track towards Fort Wilkinson and the Abyssinian border. Two South African corporals jumped out and off-loaded a tripod, theodolite, and a number of the bright orange, hydrogen-filled pilot balloons which Air Force and artillery units were gradually beginning to take seriously. At the same time, out of the truck scrambled some half-dozen lean natives, practically naked except for the arm-band of the Turkana Irregulars. The arm-band symbolized a new development in the long-standing feud between the Turkana and the Merille across the border, with their respective causes now unaccountably but actively sponsored by King George and King Victor Emmanuel.

The primeval silence over the barren mountains, the scanty bush of the sand-flats, and the glassy lake surface was broken only by a few vernacular orders to the Turkana escort as they fanned out, and by odd words of Anglo-Afrikaans as the theodolite was set up and orientated. Demolition charges, however, prepared in the early days of overwhelming enemy numerical superiority, were still ready where the road to Nairobi climbed the escarpment over 100 miles back, and, thinking of the Italians already in Fort Wilkinson, a few miles ahead, the S.A.A.F. subaltern in charge of the observations was conscious of a strong sense of the incongruity of things. The job in hand was to determine to what extent routine upper-wind and other meteorological observations at the dusty Lokitaung landing-ground, a dozen miles back, could be used for range corrections during forthcoming operations in the lake-shore area, by the Indian mountain battery which was the only Allied artillery between the Chalbi desert and the Sudan frontier. Recollection that barely six months previously one's main concern had been the physiology of the cotton plant and its pests in the Eastern Transvaal accentuated a sensation of unexpectedness; and in putting together the following notes in response to the Editor's invitation, my predominant impression of 1940-45 remains one of incongruous and unpredictable situations.

My reply to a Defence Department questionnaire to South African

amateur pilots in May, 1940, had borne unexpected fruit a month later in the form of an offer of a commission in the newly formed South African Air Force Meteorological Section. With the Corporation's cabled blessing, three months were spent on an intensive course in Pretoria under a sub-lieutenant of the Royal Naval Meteorological Service with an infectious enthusiasm for his subject, and a month's practical experience at the Rand Airport preceded posting to the Mobile Field Force in Kenya. A cramped ride up Africa in half the back seat of a Fairey Battle followed, with an interlude of a few days at Broken Hill while ethylene glycol was flown down from Nairobi to top up a leaking radiator. At Nairobi the Kabete observatory, which provides among other things the standard East African time service, and is completely maintained by an African staff, illustrated incidentally the potentialities of native technicians.

After my return from Lokitaung I was posted with a small meteorological unit to a S.A.A.F. army co-operation squadron, which was to be the eyes of the 11th African Division during a fantastic advance of 2,000 miles from the Tana River to Addis Ababa in the course of the next two months. Our own particular job was to keep Air Headquarters provided with meteorological information from the forward areas, and to supply field and medium artillery with the temperature, pressure, humidity and upper wind observations needed for range corrections.

Mildly interested giraffe watched our sweating drivers struggling with their slithering trucks following the King's African Rifles along the churned-up sandy track across the frontier into Italian Somaliland, and the credulous attributed the signs of friction high up the tree we slept under that night, and the out-size droppings beneath, to elephant. Kismayu, port of what was formerly British Jubaland, and original objective of the offensive, fell well ahead of schedule to a swift South African outflanking movement, and a demolished coastal defence battery provided a beautiful little direct-reading hand anemometer, by the Societa Italiana Apparecchi Precisione of Bologna, of which I hope to make good ecological use some day.

Moving up from Kismayu to Jelib we traversed considerable areas of Egyptian cotton, irrigated from the lower Juba, and the accompanying green mealies usefully supplemented the restricted ration scale imposed by our 500 miles from railhead. Across the Juba from Jelib was the depressing chaos of the Alessandra agricultural experimental station; the Gold Coast troops had not taken Alessandra without loss, and in the thick riverine bush was the unpleasantness of a recent tropical battlefield.

At Vittorio d'Africa the squadron camped overnight on the edge of the great Genale concession, where irrigation from the Webbe Shibeli

produced most of Italy's bananas—some of which we encountered, peeled and dried to an appetizing brown, in captured rations. Here engineers from captured Allied merchant ships, just released by the K.A.R. at Merka and already at work on the sketchy local port facilities, expressed in the accents of Clydeside their approval of the division's advance and the squadron's Kenya beer.

Ancient Mogadishu, which had known in turn the ships and traders of Rome, Persia, Arabia, China and Portugal, introduced us to the luxurious accommodation of an Italian air force station, and, whatever the operational shortcomings of the Regia Aeronautica, the work of its architects, in Libya as well as in East Africa, remains a noteworthy contribution to the problem of efficient and comfortable housing in the tropics.

Northwards from Mogadishu the tarmac of the Strada Imperiale and the pleasant greenery of Villabruzzi soon gave place to the flour-fine dust, sweltering heat and mirages of the arid hinterland. At last came sparse bush, rising gently to the undulating Ogaden plateau, where at Dagahbur sweat-encrusted bush-shirts and their desiccated owners found the first water-supply, since Kenya, which was neither heavily chlorinated, brackish nor rationed. Then on across refreshingly green, rolling grasslands to Jijiga, at the foot of the towering Marda Pass, which the Nigerians had reached on the seventeenth day of their 740-mile drive from Mogadishu. Here, for the first time since the Juba River, the advance was temporarily halted, South African and Nigerian artillery came into action, and our observations were again in demand for range corrections.

Then on again, through Harar, Moslem capital of much of mediaeval Ethiopia, and, following the Transvaal Scottish, down a 4,000 feet descent past spectacular and inconvenient demolitions into Diredawa, with its modern airport and a large and unexpected spinning and weaving mill. Through hot and dusty Awash in the Rift Valley, and finally the long gentle climb to Addis Ababa, strange jumble of Fascist Italy, nineteenth-century Ethiopia, and blue gum trees, in a setting of grassland, rocky outcrops and clear rushing streams nearly 8,000 feet above sea level.

The aerodrome bore witness to the S.A.A.F. attack of a day or two previously, which had pretty well put paid to what was left of the Regia Aeronautica in East Africa, when the Junkers 86's of South African Airways, with improvised external bomb-racks and gunners firing through their cabin windows, carried on with the job which they had begun with a raid on Abyssinian frontier posts the day Italy entered the war. The Italian meteorological equipment was, however, still in operation; we moved in, and duly changed the charts of the recording instruments at the end of the week. We met our predecessors of the

Regia Aeronautica's Servizio Meteorologico in one of the vast and almost autonomous P.O.W. camps in town, and managed to arrange to take over the records of the climatological work of their service, amounting to some thousands of volumes of routine observations made at stations throughout Italian East Africa.

Addis soon proved to be packed with technical equipment of every description, and S.A.A.F. meteorological stations from Port Elizabeth to Benghazi thus came to be equipped with the instruments and even the humidity tables of the Regia Aeronautica—equipment which at this stage of the war was virtually unobtainable from Allied sources. And the City of the New Flower, as the metaphorical Amharic has it, could even assist with our other acute problem—shortage of meteorological personnel. For at the civil meteorological observatory were the normal peace-time staff, pensioners of the 1935-36 war, who were only too happy to find a niche in the new scheme of things. Like the rest of the Italian Civil Service in the capital, they had even received a three or four months' advance of pay from their departing administration, to tide them over until the Afrika Korps should restore the status quo. They were soon busy on a new analysis of local vapour-pressure data, in addition to maintaining their so far uninterrupted routine observations. They were later joined by their former chief, taken prisoner with the colonial infantry at Jimma, and readily loaned by an overworked P.O.W. camp commandant. The meteorological service in the Italian territories had been organized on a lavish scale, and the climatological summaries completed by our hard-working Italian staff in Addis during 1941 remain in the archives of the British East African Meteorological Service as at least one tangible product of Mussolini's African empire.

The civil meteorological service had been temporarily administered by the Italian Director of Agriculture for the central province of Shoa, with whom I visited the 40-acre irrigated experimental station at Akaki, a few miles outside the city. Trials had been in progress here with introduced varieties of fruit trees, vegetables, tobacco, strawberries (which grew very well around Addis), poultry, and even bees. The Director and I proceeded to submit an unsolicited joint memorandum on the possibilities of intensive vegetable production at Akaki for the city's overcrowded civilian population, to the newly arrived Deputy Chief Political Officer, and, but for the two difficulties common to all such schemes at this time, our project might well have materialized.

The first difficulty was the complete breakdown of the whole rickety Italian administration outside the barbed-wire defences of the capital, which had occurred well before the arrival of the British forces, and had already introduced innumerable wandering Shifta to congenial careers of looting. The second difficulty faced by the almost new-born Occupied

Enemy Territory Administration was the simple discrepancy between the formidable magnitude of the task in hand and the minute size of the staff available to carry it out. Even three months after the fall of Addis the total number of officers employed in the administration of the whole of Ethiopia, Somalia and Eritrea had only just attained the strength of the European staff of the Asmara Post Office in Italian times. The achievements of this handful of slightly eccentric British administrators were to my mind not the least remarkable feature of the whole astonishing campaign.

On a later occasion I was introduced to two of the research staff of the Compagnia per il Cotone di Ethiopia, with whom I visited the ginnery and adjacent cultivation at Adama, sixty miles down the Awash road. The Adama cotton, like most of the country's rain-grown crop, had been mainly Acala, but the experts of the Compagnia emphasized the superior merits of a recently introduced variety, and in particular its resistance to the ubiquitous jassid, their most serious pest. The new variety was called U.4; perhaps I had heard of it? I explained that until Italy entered the war I had had the privilege of working at the station at which U.4 originated.

Chatting in basic French to Italian agronomists and meteorologists over thimblefuls of cognac and "whisky" (made in Addis), and seeing Italian engineering achievements such as the magnificent mountain road above Debra Sina, culminating over 10,000 feet above sea-level in a 600-yard tunnel, one began to realize how much devoted work by technicians and scientists had been sacrificed by the blunders of the corrupt and incompetent Fascist administration. Corruption was illustrated by the story of the second-rate theatrical company from Italy, visiting Addis Ababa at the expense of the State because the soubrette happened to have caught the roving eye of the Minister for the Colonies on his tour of inspection. Incompetence at its worst was exemplified by the indiscriminate massacre of Abyssinians following the attempt on Graziani's life in 1937, the memory of which seems likely to poison relations between Ethiopia and Italy long after the fine roads have reverted to cattle tracks. Civilized Italians in Addis that day saw with loathing their Fascist compatriots, devoid of the last shreds even of military discipline, machine-gunning their 9,000 victims in the streets of the city; and I recall rather vividly the unmistakable sincerity of the welcome afforded to one such civilized Italian, temporarily released from a British P.O.W. cage, by a venerable Ethiopian whom the Italian had befriended in the dark days of 1937.

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In mid-1942 the shipping route up the east coast of Africa, congested with supplies bound for the Middle East and Russia, was a particularly vital link in Allied strategy, and Axis submarines were not missing this

opportunity. In May the staff of Eastern Fleet, which had been forced back on Mombasa as a main base by Japanese air attacks on Ceylon, were faced with a further minor but not entirely negligible difficulty. The tropical cyclones of the southern Indian Ocean are among the most destructive storms experienced anywhere on the earth's surface; and the frequent and detailed meteorological observations from Madagascar, which are essential ingredients of the cyclone warning service (and which had hitherto been broadcast *en clair* by the nominally neutral French), had summarily ceased with the British operations against Diégo Suarez.

So it was that, after a 700-mile Mozambique Channel crossing from the little Tanganyika sisal port of Lindi, I landed in Madagascar one June afternoon from a S.A.A.F. Lodestar, into the powerful dust-laden trade-wind which blows for six months of the year at Diégo's airport. The bows of a torpedoed tanker off the end of the Rue Colbert, victim of a recent attack by a Japanese midget submarine which had also crippled the *Ramillies*, were a reminder of the threat from the east, and in the dry dock a German freighter and her cargo of hides literally stank to high heaven. The hides, and the bully-beef cannery on the outskirts of the town, were supplied from the excellent cattle country which covers most of the island. Tsetse fly is unknown. Only the south-western coastal regions have an annual rainfall of less than 35 inches, and the greater part of the island's original extensive forest cover has been succeeded by secondary grassland.

I was billeted in Diégo on a battalion of the South Lancashires, which had played a leading part in the capture of the town, and were later to repeat the process in the landings at Majunga and Tamatave. Meanwhile my main concern was "laying on met." for the R.A.F. Catalina flying boats, just transferred from Iceland and now operating from Mayotte in the Comoro Islands against submarines in the Mozambique Channel.

Mayotte, once an Arab Sultanate and later a nineteenth-century French naval base, is a group of small islands of volcanic origin, surrounded by a perfect coral reef, and covered with coconut palms and plantations of lemon-grass (for oil of citronella) and sugar cane. Most of the squadron's maintenance equipment was still at Mombasa, and pink-skinned aircraftmen, stripped to the waist, rowed raggedly out in commandeered boats under an equatorial sun to refuel the Catalinas' capacious tanks from four-gallon tins, delivered by the Dutch coaster which had already followed up the King's African Rifles into more than one occupied port.

The squadron had about a dozen aircraft with which to cover a million square miles or more of Indian Ocean, and, looking at some of the damage caused at Mayotte by the 1934 cyclone, still noticeable eight years later, the young R.A.F. detachment commander undertook

to fly his precious aircraft away at three hours' notice of the approach of trouble of this nature.

Leaving Mombasa by Catalina at dawn, after a brief visit to Air Headquarters East Africa, gave a grand-stand view of Eastern Fleet putting to sea, with its destroyer screen and cruisers followed by battleships and aircraft carriers just leaving Kilindini. Back at Mayotte, the small Northern Rhodesian garrison mess at the Residency was crowded with the pilots of Fleet Air Arm Fulmars and Albacores, standing by for the impending further landing operations. After hitch-hiking successively by Catalina, Dutch transatlantic liner, and battered East African Army Service Corps truck, I finally reached Tananarive a few days after its occupation by the K.A.R. towards the end of September.

Madagascar's picturesque capital, looking most un-African without corrugated iron roofs, covers the steep slopes of a rocky islet, in what was once a large lake and is now the extensive rice-fields of the Ikopa River, surrounded by a rim of mountains. The rice provided Tananarive's quite passable white bread, and drew attention to the Melanesian origin of the Malgache, who had laid out much of the elaborate irrigation system before the coming of Europeans. The highest point of the city is crowned by the palace of the last of the island's Hova queens, deposed by the French under Gallieni fifty years ago. The high-pitched roof of the original massive wooden pavilion rises well above the Victorian stone façade which was added later, and at the apex of this roof a small observation platform had recently been erected by the Service Météorologique de Madagascar. To this perch I climbed twice daily to make upper-wind observations with the ingenious French automatic recording theodolite, for so long as military operations between British and French continued, M. le Chef du Service scrupulously refrained from any direct collaboration, while conceding the use of his equipment to his uninvited guests.

Tananarive's great international wireless station was intact, and in early October, a few weeks before the cyclone season, we were able, thanks to the help of the French chief engineer and of the Royal Corps of Signals, to resume an abridged version of the meteorological broadcasts which had been our main assignment in Madagascar. The surrender of the Vichy governor-general brought the complete and loyal co-operation of the French meteorologists, and in return with the help of the local R.A.F. Lysanders, we were able to provide the Service Météo with its first observations of upper-air temperatures and humidities. One also discovered that S.A.A.F. N.C.O.s could work positively harmoniously with very black Malgache observers and East African signals staff, and at their own suggestion, could even contribute 100 cigarettes per man for distribution among their coloured colleagues at Christmas.

The surrender of Réunion to a Free French destroyer filled the last gap in the network of reporting stations needed for the cyclone warning service. We had already advised interested parties of several minor cyclonic disturbances around Madagascar, but on February 10, 1943, our synoptic charts began to show more formidable developments north-east of Mauritius. The centre of the disturbance moved westwards towards us, and the Réunion observations indicated its passage to the north of that island. Signs and portents began to appear in our east coast reports, and on the morning of the 11th we transmitted warnings to all naval and air force units affected, and also, thanks to a special temporary relaxation of security by Island Area H.Q., to the civilian population of the threatened areas. Sixteen hours later the centre of the cyclone passed over Tamatave, giving a wind-velocity which continued to rise after proving too much for the recording anemometer at 130 m.p.h. One of H.M. trawlers had been unable to put to sea on receipt of the warning, and had parted her anchor chain and an impressive array of hawsers before being blown clean across the bay and right up on to the beach, finally coming to rest on her side in a foot or two of water just short of the main street. When a portable army W/T set re-opened communications with the capital next day, we learned that the cyclone was estimated to have left 20,000 people homeless, though, partly perhaps as a result of the warning, less than a dozen fatalities had been reported.

* * * *

In August, 1943, I was posted to Advanced S.A.A.F. H.Q., then at Castel Benito outside Tripoli, to look after the meteorological services to South African forces in the Mediterranean theatre. In serving the thirty squadrons of the S.A.A.F., and, later, the artillery of the S.A. Armoured Division, South African meteorologists formed an integral part of the unified Allied meteorological organization in the Mediterranean, working in the closest association with colleagues of the R.A.F., the U.S.A.A.C., and half-a-dozen other nationalities.

With personnel scattered over an area which finally extended from Alexandria to Algiers and Ancona, my job at times involved other means of transport than the usual Transport Command Dakota. A few months after an uneventful move from Tripoli to Taranto by tank-landing ship, I was crossing the Gulf of Sirte in a Savoia-Marchetti of the Italian Air Force, flown by a complete air-crew of the now co-belligerent Regia Aeronautica, and recalling some very clear memories of less friendly Savoias, Capronis and Fiats in East Africa.

The Allied meteorological organization stopped short of infallibility, and from time to time one would be summoned to explain to a critical senior officer why, for example, a particular S.A.A.F. Mosquito had searched vainly for an hour in continuous cloud for a promised clearing;

why the forecast wind on which the aircraft had been trustingly navigated had led to its final emergence from cloud low down over the German anti-aircraft batteries around the Anzio beach-head, when the computed position of the machine was off the Yugoslav coast; and why the met. types at the alternative landing-ground, at which the shaken pilot had finally put down, had claimed to have had vital additional observations available at the time the unfortunate forecast had been issued. One would hastily recall, for example, struggles with a defective teleprinter installation at the offending meteorological unit, and advance appropriate and at times plausible explanations. On the other hand, there was the memorable and almost unique occasion when the Group-Captain commanding a combined R.A.F.-S.A.A.F. wing confided in a convivial moment that his S.A.A.F. forecast unit had increased the operational effectiveness of his wing by the equivalent of an extra squadron.

Occasionally there were opportunities of seeing people and places of agricultural and biological interest. There was, for example, the great agricultural experimental station just outside Tripoli, flourishing under the direction of a kilted professor of agriculture, who had been seconded from his duties as a company commander in the Pretoria Highlanders to organize the post-Fascist agriculture of Tripolitania. The pre-war work of the station had even been extended in a number of respects, primarily in the interests of increased local food production, while a few of the whiter Italian elephants had been discarded. By arrangement with army psychiatrists, victims of war neuroses were also working on the station, an arrangement which was proving very much to the advantage of all concerned.

Leave on Lake Victoria and the upper Nile had given an opportunity of seeing a little of the Uganda work on cotton, and now occasional duties in Cairo provided glimpses of the Egyptian crop. At Giza, W. L. Balls, doyen of cotton botanists, battled with a fascinating diversity of problems in his capacity as Chairman of the Scientific Advisory Committee of G.H.Q. Middle East, and still found time to have new glass barometer reservoirs made for heavy-handed meteorologists. Cotton cultivation was also encountered unexpectedly in Sicily, just off the Gerbini landing-ground, where a S.A.A.F. bomber wing, whose forecast unit I was visiting, was operating before the invasion of Italy.

The Naples Aquarium, classical international research centre for marine biology, afforded an encouraging contrast to the squalor and demoralization of the city. The Director was a German man of science of cosmopolitan outlook and international reputation, recalling that cultured liberal Germany of the past which had been largely forgotten since the rise of the Nazis. Our security authorities had just permitted him to resume work, and he had returned to find that, thanks to

sympathetic Allied Military Government officials, the aquarium had suffered less from military operations than had been feared. Inevitably there had been losses and damage, but he had recently received a communication from the Royal Society of battered London which not only went far to relieve the financial anxiety of the work of restoration, but also provided a practical demonstration that the outlook of science remained international. To round off the story, the Director's daughter had just married a British biologist serving as a squadron-leader in the R.A.F.

At the end of my tour of duty in the Mediterranean I was sent to England to see something of the meteorological organization of Transport Command, and was able to call in at the Corporation's Head Office during the comparative lull between the decline of the V-1s and the peak of the V-2s.

From blacked-out, rationed, and overworked England, it was a far cry to a leisurely leave in the peaceful Amatola Mountains of the Eastern Cape Province in May, 1945. On V-E day I happened to be visiting the South African Native College, at Fort Hare; and the most casual visitor could scarcely miss the contrast between the doctrine of the Herrenvolk and the promise in the atmosphere and outlook of this young university for the future of Africa.

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THE 1945-46 WORLD RAW COTTON SITUATION IN RETROSPECT

BY

DUDLEY WINDEL.

THE 1945-46 world cotton season began shortly after the termination of active hostilities both in Europe and the Far East, and consequently presented most of the features of a war-shattered international economy making its first efforts to return to normal peace-time commercial and industrial conditions. Firstly, the export movement of raw cotton from producing countries, which had suffered a severe contraction during the war period, showed a marked recovery; secondly, consumption in countries which had been cut off from raw material supplies by the Allied sea blockade started to expand, and thirdly, prices developed a strong upward trend due partly to a contracting supply meeting a broadening demand, and partly to the relaxing of war-time economic restraints.

WORLD RAW COTTON PRODUCTION IN 1945-46

On the basis of data so far received, world production of raw cotton fell sharply in 1945-46 to around 21,292,000 bales, and compared with 24,046,000 bales in 1944-45 and 27,739,000 bales in 1938-39. This big decline was due primarily to the following causes:

1. A generally unfavourable growing season in the United States and a planted acreage of only 18,316,000 acres.
2. The world-wide food scarcity which influenced the Governments of India and Egypt to enforce reduced plantings of cotton in the interests of increased sowings of food crops. The same factor also affected cotton production in several African countries.
3. Unfavourable growing conditions in both Brazil and Argentina which considerably reduced the 1945-46 cotton harvests.
4. A small Chinese cotton crop which resulted from the effects of the Japanese military invasion and post-war political unsettlement.

This combination of adverse factors resulted in world cotton production in 1945-46 declining to the smallest total since 1923-24, when boll-weevil ravages severely reduced the United States harvest. It is worth noting that almost all the contraction in last season's world outturn was in medium staples.

During the 1939-45 war period, world production of raw cotton in the aggregate exceeded world consumption by about 4,500,000 bales, but, on present indications, world production in 1945-46 was nearly

3,000,000 bales below world consumption, considerably changing the statistical picture.

APPROXIMATE PRODUCTION OF COMMERCIAL COTTON IN THE WORLD.

AMERICAN IN RUNNING BALES; OTHER GROWTHS IN EQUIVALENT 478-LB. NET BALES (000'S OMITTED).

	1938-39.	1944-45.	1945-46.
United States	11,676	11,900	8,850
Mexico	240	520	430
British West Indies	4	4	4
Other North America	27	28	28
Brazil	1,913	1,600	1,700
Argentina	300	332	330
Peru	400	325	340
Other South America	105	90	85
Continental Europe	170	80	85
Russia	3,800	2,500	2,800
Turkey	207	230	170
Persia	184	80	70
India	4,531	3,180	3,250
Burma	80	85	30
China	1,067	800	800
Other Asia	337	310	300
Egypt	1,756	960	1,070
Belgian Congo	174	180	185
Uganda	253	227	192
Tanganyika	44	35	34
Kenya	15	4	4
Nigeria	23	14	25
French Africa	60	130	115
Portuguese Africa	58	120	140
Sudan	277	290	235
Other Africa	26	18	18
Australia	12	2	2
Total World	27,739	24,044	21,292

WORLD RAW COTTON CONSUMPTION IN 1945-46

Information so far available suggests that world raw cotton consumption in 1945-46 rose to around 24,030,000 bales, which compares with 21,703,000 bales in 1944-45 and 28,507,000 bales in 1938-39. Outstanding features as regards the five major divisions are as follows:

North America.—United States consumption declined moderately further from its war-time peak, but the 1945-46 figure of 9,200,000 bales was still substantially above the pre-1939 seasonal average. The downward trend in recent seasons has been due mainly to the inability of mills to obtain enough labour to maintain three-shift working.

United Kingdom.—Consumption in 1945-46 at 1,700,000 bales was only slightly higher than in 1944-45, in spite of the reopening of most of the mills closed under the 1941 concentration. The failure of con-

sumption to expand was due entirely to an acute shortage of operatives.

European Continent.—Consumption in 1945-46 was around 2,110,000 bales compared with about 1,175,000 bales in 1944-45 and 5,679,000 bales in 1938-39. The improvement over 1944-45 reflected largely the resumption of activity by French, Italian, Belgian, Dutch, Polish and Czechoslovak mills. The 1945-46 figure, however, was less than 40 per cent. of the amount consumed in 1938-39, due mainly to the virtual elimination of Germany as a raw cotton consumer, and to the fact that textile production in most other countries had been only partially restored.

Asia.—Consumption in India at 4,000,000 bales was little changed from the 1944-45 figure, but considerably above the 2,966,000 bales consumed in 1938-39. Consumption in China increased moderately from the very low 1944-45 total of 600,000 bales, as a result of the resumption of activity by the Shanghai mills, but was still less than half the average pre-war seasonal consumption. Japanese consumption at 200,000 bales was little changed from the negligible 1944-45 figure, as by July 31, 1946, only a very small amount of raw cotton had arrived and operable spindleage had been reduced from 10 millions to 2 millions

APPROXIMATE CONSUMPTION OF COMMERCIAL COTTON IN THE WORLD BY COUNTRIES

American in Running Bales. Other Growths in Equivalent 478-lb. net Bales—(000's omitted).

	1938-39.	1944-45.	1945-46.
United States	6,858	9,568	9,200
United Kingdom	2,690	1,550	1,700
France	1,316	110	700
Germany	1,214	30	50
Italy	711	5	400
Belgium	321	100	300
Czechoslovakia	370	—	80
Netherlands	260	—	110
Poland	301	-	100
Spain	140	440	400
Switzerland	141	10	75
Portugal	89	130	145
Other Continent	816	350	450
Russia	3,765	2,250	2,800
China	1,895	600	800
India	2,966	4,100	4,000
Japan	2,641	190	200
Other Orient	482	300	400
Brazil	625	900	920
Canada	252	370	400
Other Countries	654	700	800
Total World	28,507	21,703	24,030

by war-time depredations. In 1938-39 Japan consumed the large total of 2,641,000 bales.

South America.—Consumption in Brazil, Argentine, Peru and other countries continued its upward trend in 1945-46, though the rate of increase was slowed down by the inability of the various republics to obtain new textile machinery from abroad.

World Stocks of Raw Cotton

Statistical advices so far received do not permit a detailed assessment of the world stock position on July 31, 1946, but from the information available it is possible to form a rough picture of the position. The following table clearly shows the extent of the movement of cotton from producing to consuming countries during the past season:

APPROXIMATE WORLD STOCKS OF RAW COTTON

American in Running Bales. Other Growths in Equivalent 478-lb. Bales—(000's omitted).

Countries.	1939, *July* 31.	1945, *July* 31.	1946, *July* 31.
Producing countries			
United States	13,300	11,100	7,700
India	2,100	3,900	
Egypt	200	1,700	
Brazil	700	3,700	11,500
Argentina	100	600	
Other Producing Countries	2,000	2,700	
	18,400	23,700	19,200
Importing Countries			
United Kingdom	900	1,700	1,800
Continent	1,400	500	1,900
Other Importing Countries	700	300	
	3,000	2,500	3,700
Afloat	600	300	800
Total	22,000	26,500	23,700

It can be seen from the above statistics that most of the surplus of raw cotton accumulated during the war years has already disappeared and that stocks in producing countries at the end of last July were not appreciably larger than in July, 1939. Stocks in the United States are substantially smaller than seven years ago and are mostly composed of lower grade short staples, but stocks in other producing countries are appreciably greater in the aggregate, increases being mainly in Egypt, Brazil and India. The present Egyptian surplus is composed mainly of long stapled Karnak cotton for which there is only a limited demand. The Brazilian surplus is mostly in Brazilian Government hands and is

being released only gradually. The Indian surplus is principally less desirable short staples.

Stocks in consuming countries have increased substantially over the past twelve months following a liberal import movement into continental countries and China. Purchases of United States cottons have been greatly facilitated by a 4 cent export subsidy and the generous credits offered by the Export-Import Bank. United Kingdom stocks held fairly stable during 1945-46, but were about double the 1938-39 figure, largely as a result of very large purchases during the war years of Egyptian, Sudan and Brazilian cottons and liberal United States Lend-Lease consignments.

World Raw Cotton Prices in 1945-46

Cotton prices developed a marked upward trend during the past season, but movements in the various countries showed considerable variation on account of political interference. United State prices advanced strongly following the weakening of O.P.A. controls, and quotations for South American cottons rose in sympathy, the strength of Brazilian values being helped by the Brazilian Government's decision to hold a large part of its stocks off the market. Egyptian quotations for short staples also advanced, but prices for long staples were held in check by the burdensome supply position. Indian prices advanced only very moderately due to internal price ceilings, and the Government's decision towards the end of the season to ban further export sales. Sudan and British East and West African cotton prices have been fixed by inter-Governmental arrangements.

So far as importing countries are concerned, cotton prices vary considerably as a result of the divergent economic policies of their respective Governments. For example, prices in the United Kingdom have been based primarily on the overall cost of the substantial stocks previously bought and have consequently been kept well below current replacement costs. Canadian prices have been stabilized at a low level by direct Government subsidization. France has imported in bulk and periodically fixed selling prices to spinners. Italian mills have operated largely on raw cotton supplied by foreign interests and spun on commission. And so on.

It can be seen, therefore, that a world price of cotton based on open supply and demand does not at present exist. The United States export subsidy has cheapened American cotton by 4 cents a pound to foreign consumers, but there is no certainty that this will be maintained. The future trend of prices in the various countries will therefore be dependent more on political policies than on normal economic influences.

COTTON PRICES IN PRINCIPAL PRODUCING COUNTRIES

	Mid-August, 1945.		*Mid-August*, 1946.	
	Foreign Currency.	*Equiv. Pence per Lb.*	*Foreign Currency.*	*Equiv. Pence per Lb.*
Alexandria				
Ashmouni F.G.F.	35.25 tallari	17.65d.	38.00 tallari	19.00d.
Karnak F.G.F.	39.00 ,,	19.50d.	41.00 ,,	20.50d.
Bombay				
Jarilla	384 rupees	8.90d.	453 rupees	10.42d.
Sao Paulo				
Type 5	88.50 cruzerio	8.75d.	182.00 cruzerio	18.00d.
Lima				
Type 5	108 soles	9.85d.	181 soles	16.50d.
Buenos Aires				
Type B ..	13.00 pesos	10.65d.	20.70 pesos	17.00d.
New York				
Middling 15/16 in.	22.75 cents	13.65d.	35.75 cents	21.45d.

WORLD RAYON PRODUCTION

In view of the increasing competition with natural fibres from synthetic products it might be of interest to review the development of rayon production during recent years.

(IN MILLIONS OF POUNDS).

Year.	*Yarn.*	*Staple Fibre.*	*Total.*
1938	996	912	1,908
1939	1,150	1,147	2,297
1940	1,182	1,294	2,476
1941	1,272	1,563	2,835
1942	1,200	1,480	2,680
1943	1,163	1,410	2,573
1944	1,033	1,049	2,082
1945	934	596	1,530

(Statistics by courtesy of " Rayon Organon.")

World rayon production reached its peak in 1941-42, but declined sharply after 1943 as a result of the radically reduced output of continental European countries and Japan. Factors contributing to this contraction were war damage, shortages of wood pulp, and general economic disruption.

During the coming years world rayon production will probably resume its former upward trend as the German and Japanese mills, and

new rayon factories which are being erected in many other parts of the world, come into operation. Output in 1946, according to the "Rayon Organon," may approximate 1,700 million pounds, but even this improvement would leave the world output less than two-thirds of the 1942 peak.

General Conclusions

World production of textile fibres in the aggregate—*i.e.*, cotton, wool, silk, rayon and jute—fell in 1945 to the lowest level for the past ten years, and this took place in face of a world-wide acute shortage of textile goods of all kinds.

Prospects for the coming twelve months can be summarized as under:

1. World consumption of textile fibres (both natural and synthetic) will show a further marked expansion as industrial recovery proceeds. World raw cotton consumption in 1946-47 will probably exceed 25 million bales.
2. It is doubtful if world raw cotton production in 1946-47 will be appreciably greater than in 1945-46, owing to the small U.S. acreage and scarcity of foodstuffs in other cotton-producing countries.
3. World rayon output in 1946-47 will not increase sufficiently to offer serious competition to the natural fibres.
4. Combined world output of raw cotton and rayon in 1946-47 will, on present indications, fall short of world consumption by the equivalent of 3 to 4 million bales.

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NOTES ON CURRENT LITERATURE

COTTON IN INDIA.

354. INDIA: LESS COTTON. (*The Ambassador*, 7, 1946, p. 126.) India has reduced its cotton acreage in recent years, partly as a result of the campaign to grow more food, and partly following the loss of important export markets. The 1944-45 crop acreage and yield were respectively 14,803,000 acres and 3,543,000 bales; comparative figures for 1943-44 were 21,086,000 acres and 5,258,000 bales. The 1945-46 acreage is estimated as low as 12,500,000 acres. The decline does not appear likely to be arrested in the immediate future. Indian cotton circles are concerned about the increasing cotton stocks, especially as they will affect India's position in relation to world markets.

355. REPORT ON THE STAPLE LENGTH OF THE INDIAN COTTON CROP OF THE 1944-45 SEASON. (*Stat. Leaflt. No.* 1, 1945. Ind. Cent. Cott. Comm.) The crop of the 1944-45 season is estimated by the Government to produce in bales of 400 lb.:

Long staple, over 1 inch	197,000
Medium staple, $\frac{7}{8}$ to 1 inch	2,158,000
Short staple, below $\frac{7}{8}$ inch	1,188,000
Grand total	3,543,000

356. SUPPLY AND DISTRIBUTION OF THE VARIOUS TYPES OF INDIAN COTTON DURING THE SEASON 1943-44. (*Stat. Bull. No.* 14. Ind. Cent. Cott. Comm., 1945. Price: 12 annas.) A review of the 1943-44 season is followed by statistical and other information concerning: Area under improved varieties of cotton from 1941-42 to 1943-44; supply and distribution of the various types of Indian cotton during the twelve months commencing September 1, 1942; the Indian cotton crop of 1943-44 classified according to staple length; stocks of Indian cotton held on January 31, 1945, by the mills and the trade in Madras Province; exports. Various appendices deal with: Bombay average prices for Broach, 1929-30 to 1943-44; Indian cotton crop classified according to staple length, 1929-30 to 1943-44; stocks of Indian raw cotton held by the mills and the trade in India on August 31, 1940 to 1944; receipts at mills in India of raw cotton classified by varieties, 1934-35 to 1943-44; Indian raw cotton consumed in Indian States and Indian mills 1934-35 to 1943-44; exports by sea of Indian cotton classified by varieties, 1934-35 to 1943-44; exports of Indian cotton, and prices, 1934-35 to 1943-44.

357. COTTON CLOTH PRODUCTION. (*Cotton*, M/c, 24/8/46.) The Chairman of the Indian Cotton Textile Control Board stated recently that the average monthly output of the Indian cotton mills during the first five months of 1946 was only 350,000,000 yards, against an estimated monthly average of 370,000,000 yards in the corresponding period of last year. The fall in production was caused by strikes, hartals, and shortage of labour. In Bombay City alone it was estimated that, mainly because of strikes and hartals, there had been a loss of production of 72,000,000 yards of cloth in the first five months of this year. This loss did not include that due to the employment of large numbers of unskilled workers to offset the increased absenteeism among skilled workers. Many mill workers normally return to their villages to help with the farm work during the early months of the year, but this year the numbers

who were absent, and the average duration of their absences, were much larger than during the previous three years.

358. Indian Central Cotton Committee. At the summer meeting of the Committee held on August 2 and 3, 1946, the following among other important matters were discussed: The proposed adoption of official American Cotton Staple Standards; floor and ceiling prices of cotton for the 1946-47 season; policy regarding the exports of Indian cotton; the planned production of cotton. The Agricultural Research Sub-Committee reviewed the many schemes financed by the Committee in the different Provinces of India, and received the progress reports of the Directors of Agriculture concerned.

359. Spinning Test Reports on Indian Cottons, 1940-46. By D. L. Sen. (*Tech. Circs.*, Nos. 644-49, 651. Ind. Cent. Cott. Comm., 1946.) The circulars contain the grader's report and spinning test results for Surat, 1941-45 seasons; Bawla, 1944-45 season; African AR.B.P. 52, 1945; Gaorani 6, Malvi, 1943-46 seasons; Wagad, 1944-46 seasons; the report of the Standards Committee and spinning test results for Verum, 1940-45 seasons.

360. Technological Reports on Indian Cottons, 1945-46. By D. L. Sen. (*Tech. Circs.*, Nos. 650, 652. Ind. Cent. Cott. Comm., 1946.) The particulars include agricultural details, grader's report, fibre particulars, spinning test results, remarks.

Umri Bani.—The cotton for the 1945-46 season has practically the same mean fibre length and fibre weight per inch as its predecessor, and possesses nearly the same percentage of mature fibres, but the fibre strength is somewhat lower. The cotton would gain by being picked in a cleaner condition. Suitable for 29's warp.

Jarila.—This cotton has shown an appreciable decline in spinning performance since 1941-42. The yarns obtained from it are somewhat neppy. Suitable for 27's warp.

361. Cotton Mill Expansion. (*Cotton*, M/c, 8/6/46.) It is reported that the Government of India has announced its intention of issuing licences for the construction of new spinning mills in India in pursuance of the policy of expansion recommended by the post-war planning committee. This committee, which the Government appointed early last year, found that it was desirable to increase the productive capacity for mill-made cloth by 50 per cent. to 7,200,000,000 yards per annum, but that such a project could not be carried out at once because of the shortage of textile machinery. As an interim measure, therefore, it recommended an increase of 1,700,000,000 yards, or about 35 per cent., in cloth production, involving the erection of some 2,750,000 additional spindles. Many new cotton textile companies have been formed in India during the last few months, mainly to operate in Bengal and the other "deficiency areas."

362. Post-war Mill Construction. By T. V. Baddeley and F. Stones. (*Ind. Text. J.*, **56**, 1946, p. 304. From *Text. Tech. Digest*, iii, 4, 1946, p. 198.) A comprehensive consideration of the many problems concerned with construction of a textile mill in India of the latest design, incorporating all the proper health conservation features, is presented. Working standards are discussed. A general floor plan for a mill is given. Comparisons with mills in England, the United States, and elsewhere are made.

363. Bombay: Bombay Cotton Annual, 1944-45. No. 26. (East India Cotton Assocn. Ltd., Bombay. Price: Rs. 3.) This is the usual authoritative compendium of all matters relating to every branch of the cotton trade. The first section contains the Twenty-fourth Annual Report of the Directors of the East India Cotton Assocn. Ltd. for the 1944-45 season. This is followed by numerous statistical tables of acreages, production, imports, exports, consumption, stocks, prices, and textiles; Government notifications, etc. The publication should meet the requirements of all who are interested in the production, distribution, and consumption of Indian and foreign cottons, yarn, and cloth.

364. Mysore: Improved Varieties of Cotton Grown in the State. By L. S. Dorasami. (*Mysore Agr. J.*, **21**, 1942-43, p. 55. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 130.) An account is given of recently developed and introduced varieties of

Mysore-American, Madras-American, Egyptian, and Asiatic cottons. The work of acclimatization of long-staple cottons is in progress. Mention is also made of a programme of hybridization and selection to evolve new adapted strains.

365. COMPOST MANURE FROM TOWN WASTES. (*Ind. Frmg.*, vii, 3, 1946, p. 140.) The scheme for the production of manure from town wastes sponsored by the Imperial Council of Agricultural Research has been in operation in Mysore since 1943. Some 40 sanitary inspectors have received training in compost production work in 30 municipalities in the State. By the end of 1945 over 20,000 tons of compost of good quality had been prepared, and approximately 8,000 tons had been purchased by ryots for use on their lands. Proposals for the extension of the Compost Scheme to cover all the urban centres in the State are under consideration by the Government.

366. ORISSA: PROSPECTS OF BETTER COTTON. (*Ind. Frmg.*, vii, 4, 1946, p. 207.) The area under cotton in Orissa is about 9,000 acres. A few years ago trials were carried out with long-staple cotton, but were abandoned as it was considered that such cotton would not thrive in the country. Similar experiments were, however, undertaken in 1945 with 60 improved types of long- and short-staple cottons, and indicated that some long-staple types could be grown quite successfully in Orissa, where the rainfall is low and canal water irrigation is available. A few types of short-staple hill cotton from Assam also showed promise. With the assistance of the Department of Agriculture the haphazard introduction and trial of cotton in Orissa are being superseded by systematic trial and selection in order to maintain the purity of the introduced types and to provide facilities for the successful cultivation of these cottons under the cultivators' conditions.

367. PUNJAB: COTTON IN 1945. (*Ind. Frmg.*, vii, 2, 1946, p. 89.) The planting of the crop was carried out in good time, but resowing of some fields had to be done in some parts of the Canal colonies owing to damage caused to the germinating crop by an insect locally known as *Toka* (*Chrotogonous* sp.). Locust swarms entered the Punjab from the N.W.F. Province, and control measures were immediately organized. Little damage was done to the standing crops.

368. INFLUENCE OF AGRONOMIC TREATMENTS ON GINNING PERCENTAGE IN PUNJAB COTTONS. By M. Afzal *et al.* (*Ind. Jour. Agr. Sci.*, xv, 4, 1945, p. 184.) The variations produced in the ginning percentage of a few Punjab-American and *desi* varieties of cotton by some of the important agronomic treatments have been studied. By application of 3 to 8 irrigations, each of 3 in. depth, the ginning percentage generally declined as the quantity of water applied to the crop increased. This reduction is mainly the result of increase in seed weight. The application of 20 in. water in 3 to 9 irrigations of different intensities failed to affect ginning outturn appreciably during 1942-43, but in the succeeding year 8 irrigations, when applied in doses of 2½ in. each, gave significantly higher ginning percentage than all the other intensities. So long as the total quantity of water applied to the crop remained the same, starting irrigations early or delaying them by even one month did not make any difference in the ginning percentage. Application of lighter irrigations in the early stages of growth and heavier ones near the flowering and fruiting time of the crop produced no change in ginning percentage. There was no difference in the ginning percentage of crops grown under flat or ridge irrigation. The effect of addition of increasing doses of sodium nitrate was progressively to depress the ginning percentage, mainly as a result of increase in seed weight. Sowing dates and spacings affected the ginning percentage of varieties significantly, higher values of this character having been obtained with early sowings and closer spacings. The possibility of achieving higher ginning percentage of varieties by effecting changes in the commonly used agronomic treatments in the Punjab has been discussed.

COTTON IN THE BRITISH EMPIRE (EXCLUDING INDIA).

369. ASIA. COTTON IN CEYLON. By M. F. Chandratane. (*Trop. Agriculturist*, Cl. 3, 1945, p. 164.) A paper read before the Central Board of Agriculture, Peradeniya,

in May, 1945, in which the following were dealt with: The three classes of cotton commonly recognized by the trade—fine staple, medium staple, and short staple; the early experiments with cotton in Ceylon, dating from 1903; the Botanist's recent work on cotton selection; the Cotton Purchase Scheme; climatic and soil requirements; choice of variety; the size of the cotton holding. A discussion followed.

370. COTTON EXPERIMENTS, 1944. (*Admin. Rpt. of Actg. Dir. Agr.*, 1944. Received 1946.) At Tissamaharama the performances of 19 strains—5 fine and 14 medium staple—were under investigation. All the strains, except Cambodia Co. 3 and Co. 4, were at least in their fourth year, and were presumably fairly well acclimatized. Yields were satisfactory: five strains—BP79, SG29, Cambodia Co. 2, Cambodia Co.4, and Mwanza 613—gave yields of over 7 cwt. seed cotton per acre. The estimated staple length of all the cottons was over $\frac{7}{8}$ inch. Seven strains—BP79, BP52, BP116, 5143 × Cambodia, (5143 × Cambodia)5143, U4/4, and SG29—possessed staples of over 1 inch. In a replicated trial of the most promising strains, BP79 significantly outyielded 5143 × Cambodia, U4/4, and BP116, and would appear the most promising strain for the country. In an experiment designed to investigate the effects of soil tillage on yield and on weed control, the effect of intercultivation appeared to be mainly in weed control. Intercultivations in excess of the minimum necessary for weed control conferred no additional benefit. The yields of seed cotton were almost as high in plots with a ground cover of green gram as in intercultivated plots.

371. CYPRUS: COTTON INDUSTRY, 1945. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1944-45. Issued 1946.) The area under cotton was 7,000 acres, from which a crop of 2,380 bales of 400 lb. was obtained. Although the season was a late one, bollworm attack was only light. The American-type cotton known as Coker 100 continues to be popular, and the area under this variety is increasing.

372. PALESTINE: GENERAL MARKET CONDITIONS. (*Overseas Rev.*, Barclays Bank, July, 1946.) Markets were fairly active throughout the month. The retail trade in textiles in particular was reported to have been more active, and the downward trend in prices seems to have been arrested. The construction of new textile works locally is continuing despite the uncertainty which has recently prevailed in the textile market, and it is anticipated that the output of cotton yarn in Palestine will increase very considerably and will in time leave an exportable surplus. The supply of textiles from the United Kingdom has not been kept up, and it would seem that their place is to some extent being taken by Italian and other goods.

373. AFRICA. GOLD COAST: NATIVE WEAVERS. (Col. Off. Press Section, 13/8/46.) A weaving industry has been set up on an experimental basis in Mampong, Akwapim, Gold Coast, by B. A. Okantah and A. E. Asare. Both have taken weaving courses at Achimota College, and the scheme is partly financed by Dr. Oku Ampofo. The West African Industrial Board is considering an application for official recognition and financial assistance. The three hand looms at present used are Togoland-made, and three more are on order. Besides Okantah and Asare, there are two spinners who were trained in Awatime, and three apprentices. The industry has made a good beginning, and orders are pouring in from as far afield as Kumasi. At present yarn from Peki and Awatime is used, but farmers in Apirede, Akwapim, have been supplied with cotton seed, which in time should provide enough yarn to meet the ever-increasing demand of the industry.

374. KENYA COLONY: COTTON INDUSTRY, 1945-46. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1944-45. Issued 1946.) The latest report states that in Nyanza Province, after a promising start with new seed (B.P. 52 from Uganda), a prolonged drought resulted in severe boll shedding, even in the later main area, where also *Lygus* damage was considerable. Some improvement was seen in November with renewed rains, but the general condition of the crop is disappointing, and reduced yields are expected. In the Coast Province also the crop made a promising start, but unfavourable conditions later have resulted in reduced yields, although the quality of the crop is good.

375. COTTON INDUSTRY, 1945-46. (*Crown Col.*, June, 1946, p. 443.) The total cotton crop for the season is estimated at 5,000 bales.

376. NIGERIA: TEXTILE INDUSTRY. (*Crown Col.*, July, 1946, p. 527.) A £90,000 scheme for the development and improvement of the peasant textile industry is planned. The Department of Commerce and Industries has appointed a Textile Expert, and he is to have eight Territorial Centres under him at which surveying, investigation, and experimental work of all kinds for the respective areas and trades will be carried on. The people will be taught improved methods of spinning and weaving, and will also be assisted in marketing their products to the best advantage and in purchasing raw materials at reasonable prices.

377. NYASALAND: COTTON PROSPECTS, 1945-46. (*Crown Col.*, August, 1946, p. 608.) In the Lower River area floods and weed growth have affected the cotton crop, but in other districts conditions are more favourable, and there appears no reason to doubt that the output this season will be greater than last.

378. NYASALAND COTTON. (*Crown Col.*, July, 1946, p. 516.) Under the long-term agreement by which the Government undertook to buy all Nyasaland cotton not sold elsewhere, purchases are being made at 8·15d. per lb. f.o.b. for the Southern crop and 8·60d. per lb. for the Northern crop.

379. LAND TENURE IN NYASALAND. (*Crown Col.*, July, 1946, p. 516.) Of approximately 20,500,000 acres of Native Trust Land, only 32,000 acres had been alienated by the end of 1945. Of 3,000,000 acres of Crown and reserved land, 1,250,000 acres had been alienated by that date. The Nyasaland Government is giving close attention to questions of land tenure and policy, and an investigation will shortly be undertaken by Sir Sidney Abrahams.

380. SOUTHERN RHODESIA: COTTON INDUSTRY. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1944-45. Issued 1946.) The place of cotton in the agricultural system appears generally satisfactory, and soil fertility at the Cotton Station, Gatooma, has been steadily maintained at a high level by a system of mixed farming. It is now proposed to investigate the possibilities of improving yields further by the use of temporary grass leys. The work of improving by selection the strain of cotton grown in the country is being steadily pursued, and various hybrid strains from Barberton are also under observation.

381. SOUTH AFRICA: COTTON INDUSTRY, 1944-45. (*Rev. of* 1944-45 *Cotton Crop.* Received 1946.) Owing to lack of rain during normal planting time, and extreme heat, the germination was uneven. Much of the cotton that germinated was scorched. Late plantings yielded a poor crop due to drought and an early winter.

382. COTTON INDUSTRY, 1945-46. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1944-45. Issued 1946.) The season opened with a prolonged and severe drought and only a very small acreage was therefore planted in cotton, though a slight increase is reported from the Barberton area. The increase would probably have been greater, as the sale of the current season's crop is guaranteed at a fixed price, but the drought of the 1944-45 season extending into the early part of this season made the growing of food crops a prime necessity. Further, though the sale of the crop is guaranteed, the price is still very low compared with other farm produce, and this tends to limit acreage still more.

Prospects for 1946-47.—Following drought conditions until the end of December, very heavy rains fell during the first two months of 1946, causing erosion and water-logging of lands; continuous overcast conditions with lack of sunshine have favoured aphis damage, and yields will largely depend on whether adequate temperatures and sunshine were experienced during March and April.

383. SUDAN: COTTON INDUSTRY, 1945-46. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1944-45. Issued 1946.) The areas sown to cotton in the Gezira are slightly less than in the previous two seasons, and crop estimates are lower owing to widespread jassid attack and unfavourable weather conditions. 10,000 feddans of cotton land were put under dura in order to help relieve the acute grain shortage. The area sown to cotton in Tokar is greater than in the previous season, although in general the flood was not so good. Widespread locust attacks have reduced crop estimates, but over 90,000 kantars are expected. In the Gash Delta also locust damage has reduced the crop estimates. In the Government Schemes Gondal and Abdel Magid have been

sown with X1730A and the other schemes with Sakel. Owing to severe jassid attack and unfavourable conditions crop estimates are considerably below last year's figures. An experiment to control jassid by means of a DDT spray was successfully carried out at Abdel Magid. On private estates the Sakel crop promises well and has not suffered from jassid attack to the same extent as certain parts of the Gezira. The area planted to cotton in Kordofan was reduced by roughly three-quarters in order to assist in the increased dura production drive. The crop is looking well. In the coming season it is intended to increase considerably the cotton area and restore the industry to its pre-war level. The Equatoria area has been considerably increased and the crop promises well.

384. TEXTILE IMPORTS. (*Overseas Rev.*, Barclays Bank, July, 1946.) The stock position continues satisfactory. The quota of cotton piece goods from the United Kingdom for the third quarter of 1946 will be 3,715,000 square yards, compared with about 600,000 square yards allocated for the second quarter of this year. The quota from India for the second half of 1946 has not yet been allocated. Distribution of cotton piece goods in the Sudan remains under strict control.

385. TANGANYIKA TERRITORY: COTTON INDUSTRY, 1945. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1944-45.) After two successive bad seasons in the Lake Province, the 1945 season showed a very satisfactory improvement. The total seasonal rainfall was nearly average, but distribution was poor. In the south of the Province the crop was able to mature itself in the absence of the usual heavy stainer attack. On the other hand, the Eastern Province experienced almost the worst season on record. Late planting, abnormally heavy rain earlier on and its sudden cessation at the beginning of June, and an inordinately heavy infestation of insect pests, particularly in the main cotton areas of Kilosa and Morogoro, all contributed to this fall in production.

386. UGANDA: COTTON INDUSTRY, 1945-46. (*Ann. Rpt. Dpt. Agr.*, 1944-45. Received 1946.) In the Eastern Province although all precautions were taken to ensure the purity of the B.P.52 introduction to Budama, some impurity (up to 14 per cent.) was discovered by means of detailed seed sampling and counts by the Senior Botanist, and fresh seed was therefore sent from Buganda to resupply Budama. The lateness of the spring rains and incipient famine again made it essential to concentrate on food crops in some areas, and cotton planting was delayed. In the Western Province the prolonged dry season, combined with the need to grow a large acreage of food crops as soon as possible, caused delay in the planting of cotton. Withdrawals of seed for planting purposes were high, and it was expected that a normal, though late-planted, acreage would be cultivated.

387. COTTON PRICES, 1945-46 SEASON. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1944-45. Issued 1946.) Prices to growers for the coming buying season have again been increased by amounts up to Shs. 2s. per 100 lb. seed cotton, and it is hoped that these price increases may lead to growers taking all possible care in picking the whole of their crop and in maintaining grade. There are no indications that the propaganda aiming at the increase of food crops required for war-time needs has in any way affected the general attitude of the African grower to cotton, which he will still normally regard as his primary cash crop.

388. COTTON PROSPECTS, 1946-47. (*Overseas Rev.*, Barclays Bank, July, 1946.) Rains have continued in Uganda and the Lake areas of Kenya. Elsewhere cold and dry conditions prevail. Planting of cotton has been general throughout Uganda, and will continue during July. Conditions are said to be favourable, but in some districts planting has been delayed owing to the lateness of the rains.

389. AUSTRALASIA. QUEENSLAND: COTTON RESEARCH STATION, BILOELA. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1944-45. Issued 1946.) The Department of Agriculture has been reorganized and regional experiment stations established where investigations may be conducted bearing on both the plant and animal industries. The Cotton Research Station at Biloela is well situated to serve a large section of the country in which cotton, sorghum, and cereals are produced in conjunction with dairying and pig-raising. It has therefore been included in a series of regional

experiment stations. Cotton will continue to occupy the first place in the programme of investigations, but more comprehensive work than has been possible in the past is contemplated in the other crops. The programme at the present time comprises selection work on cotton varieties—with the object of obtaining higher yielding strains and better jassid resistance—as well as experiments on various agricultural operations and rotations. Preliminary investigations have also been set on foot to study soil structure and fertility.

Prospects for the 1945-46 *season.*—The season made a good start on satisfactory planting rains in September, but the cotton acreage showed a further drop owing both to lack of labour and to the high prices prevailing for food crops and other farm produce. Writing later in the season, the Cotton Specialist reported that crop prospects varied considerably in different localities, but the average yield over the whole area planted was not likely to exceed ¼ bale per acre.

390. Cotton Jassid in Queensland. See Abstract 464.

391. WEST INDIES. The Imperial College of Tropical Agriculture, Trinidad. In the report for the year ended December 31, 1945, it is stated that research work was continued on the banana and cacao crops, and summaries are included on the investigations carried out by the Departments of Agriculture, Botany, Chemistry and Soil Science, Economics, Entomology, Mycology, and Sugar Technology. The number of students in residence during the year was 48, against 61 in the previous year. Owing to transport difficulties only three of the sixteen Colonial Office scholars were able to come to Trinidad, and two refresher students nominated by a well-known British tea firm also failed to arrive for the same reason. The Associateship was awarded to nineteen candidates and the Diploma to thirty. Twenty-six scientific papers were published during the year, including those in *Tropical Agriculture.* The following additions were made to the Library: parts of periodicals, 6,355; pamphlets, 2,550; books, 139.

COTTON IN THE UNITED STATES.

392. Cotton Quality Statistics, United States, 1944-45. (*U.S. Dpt. Agr., Prod. & Marktg. Admin., Cotton Branch,* Washington, D.C., 1945. Received 1946.) The purpose of this report is to furnish a permanent record of the quality of cotton ginned in the United States during specified periods, by States and by districts, and of the quality of the cotton in the carry-over on August 1 in each year. The term "quality" as used in the report refers to grade and staple length. For the carry-over statistics are included on the grade and staple length of Upland and American-Egyptian cottons, and on the staple length of cotton of foreign growth on hand in the United States on August 1, 1945. The tables in the report, which contain data regarding the tenderability of cotton on contracts for future delivery, indicate only the total quantities tenderable and those untenderable.

393. Agricultural Statistics, 1945. U.S. Dept. of Agr. (For sale by Supt. of Documents, U.S. Govt. Printing Office, Washington 25, D.C. Price (paper) $1.00.) This is the tenth issue of this publication prepared under the direction of the Yearbook Statistical Committee. It includes statistics of grains, cotton, sugar, tobacco, oilseeds, fats, oils, fruit, vegetables, melons, tree nuts; hay, seeds, and minor field crops; beef cattle, hogs, sheep, horses, and mules; dairy and poultry products; farm capital and income; agricultural conservation and adjustment statistics; miscellaneous statistics. A table of weights, measures, and conversion factors used in the Dept. of Agriculture is also included, and the volume is furnished with a useful index.

394. American Cotton Crop, Season 1946-47. (*Cotton,* M/c, 27/7/46.) It is stated in the Official Weekly Weather Report that the progress and condition of the crop have been generally good in the Eastern part of the Cotton Belt, and the weather has been favourable for checking boll weevil in the Western part of the belt. Cotton gins are reported to be operating to capacity in the Rio Grande Valley district of Texas, and harvesting is in full swing in the coastal bend.

395. Looking Ahead with Cotton: Some Trends and Some Choices. (*U.S.D.A. Misc. Publn.* 584, 1945. From *Exp. Sta. Rec.*, **94**, 6, 1946, p. 819.) This publication, prepared by the Bureau of Agricultural Economics and the Extension Service, discusses the trends in cotton production, the competitors of American cotton, the problem of price of cotton, the balance between agriculture and industry in the South, and some of the choices of policy regarding cotton.

396. Cotton Textiles in the United States. By J. D. Campbell. (*Curr. Frm. Econ.*, xix, **1**, 1946, p. 6.) The demand for cotton textiles continues to exceed supply. There is plenty of cotton available. The supply of middling grades of 15/16 to 1 inch staples is lower than normally, but is not yet a limiting factor in textiles production. It will be several months before adequate supplies of cotton textiles will be available for domestic and foreign consumption.

397. Looking at the Future of Cotton Textiles. By W. Delaney. (*Text. Bull.* 69, **5**, 1945. From *Text. Tech. Digest*, iii, **2**, 1946, p. 52.) Research in harvesting, ginning, and processing cotton fibre, and in many aspects of fabric manufacture from the fibre, will influence technological progress and be a potent factor in determining the future of the cotton textile industry in the United States.

398. American Cotton: Call for a Larger Research Fund. (*Cotton*, M/c, 20/7/46.) Reports from Washington state that the president of the Alabama Farm Bureau Federation, Mr. Walter Randolph, in a recent testimony before the House Agriculture Committee, called for a sevenfold increase in funds for cotton research. He recommended that the amount spent annually on cotton research be increased $8,000,000 as a necessary minimum, and that the funds must come from State and Federal Governments, since the cotton farmer is unable to support a large research programme, and the cotton textile industry has become "one of the most backward of all industries in technological progress." Mr. Randolph continued: "The chemical industry, as a whole, spends 2 per cent. of its gross revenue on research. All the fibres that threaten cotton's markets most seriously to-day are produced either by the chemical industry or by other industries which capitalize on the research of the chemical industry and also have big research programmes of their own. The gross revenue of farmers from cotton and cotton seed in recent years has averaged about 1·3 billion dollars per year. Two per cent. of this figure would be $26,000,000. The money spent for research on cotton is between $3,000,000 and $4,000,000 a year—or approximately one-seventh of what it would have to be to give cotton a chance against its competitors." The advances made in recent years in connection with rayon, nylon, and paper were described, and the opinion was expressed that "if the comparative research expenditures on cotton and other fibres continue as they are to-day, the defeat of cotton in the race for survival is a certainty."

399. American Cotton: Mechanized Production. (*Cotton*, M/c, 29/6/46.) Invented and perfected before the war, the mechanical cotton picker has been tested, and its record is impressive. It works more than 60 times as fast as man, and picks 900-1,000 lb. of cotton an hour—a good picker's hand gathers 15 lb. in the same time. In a three-year test the machine reduced the average cost of picking a bale of cotton from 32 dollars and 14 cents to 5 dollars and 83 cents.

The mechanical picker has gone into mass production by the International Harvester Company, and will appear soon on cotton fields and plantations. Although its first impact is expected on agricultural and social conditions in the South—*e.g.*, by continuing the already important shift of farm hands to other crops and industries—the reverberations of mechanized cotton growing are bound to reach mills and markets.

400. Cotton Harvesting. By F. W. Westbrook, Jnr. (*Text. Age*, ix, **11**, 1945. From *Text. Tech. Digest*, iii, **2**, Virginia, 1946.) An illustrated description of mechanized harvesting and chemical defoliation, insecticide dusting, and other expedients for lowering the cost of cotton production.

401. Report of the Chief of the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, 1943-44. By P. N. Annand. See Abstract 460.

402. ARIZONA: COTTON RESEARCH. (*55th Ann. Rpt. Agr. Exp. Sta.*, 1944-45. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 162.) Selection of Santan Acala has been continued. Selection has been carried out in the F_2 of Santan crossed with New Mexico 1517, Stoneville 2B and Wilds No. 13, and in the F_1 of the backcrosses of Santan × New Mexico 1517 and Santan × Wilds No. 13 to each respective parent. F_2 plants with lint stronger than that of the stronger parent were obtained in each cross and in the F_1 backcrosses in which the parent with the stronger lint was used as the recurrent parent. Highly significant positive correlations between lint length and strength were found in the F_2 generations of Santan × New Mexico 1517 and Santan × Stoneville 2B. In the work of breeding long-staple cotton, F_4 families of the second backcross of Pima × Tanguis to Pima were selected for lint characters. Previous reports of the resistance of Acala to nematode have been confirmed. Individual plants vary considerably in degree of resistance.

403. EXCESSIVE FIELD EXPOSURE COUPLED WITH DRYNESS OF LINT MAY BE RESPONSIBLE FOR DIFFICULTIES WITH "IRRIGATED" COTTON. By R. S. Hawkins. (*Mimeographed Rpt. No.* 79, Arizona Agr. Exp. Sta., 1945.) Data obtained by the Agronomy Department during recent years indicate that variations in irrigation within the wide limits of the experiments used do not cause as great differences in such factors as fibre length and strength as do seasonal differences, probably climatic. Various indications point to the probability that excessive field exposure has much more of a detrimental effect on the spinning quality of cotton fibres than do irrigation variations. U.S. Dept. of Agriculture and Bureau of the Census data show that Arizona cotton is left in the field longer periods after opening than anywhere else in the United States. Lack of labour has been the cause of this unsatisfactory situation. Machine harvesting may be the answer to the problem. It appears more than probable that excessive field exposure is accompanied by excessive drying of the cotton fibres and that this lint is still too dry for good spinning when it gets to the mill. Timely harvesting would go a long way toward remedying this situation, and the installation of moisture-adding devices in the gins of the arid South-west might further correct the difficulty.

404. ARKANSAS: MECHANIZED CULTIVATION OF COTTON. (*Cotton*, M/c, 3/8/46.) Reports from Clarkedale, Arkansas, state that Arkansas cotton growers were favourably impressed at a recent demonstration of almost all currently available types of mechanical cultivation equipment on the 220-acre Delta Substation farm of the Cotton Branch. Six different models, varying from "flame cultivators" to "mechanical hoes," were demonstrated over a field which had been allowed to become exceedingly grassy. The results were very satisfactory, and the conclusion was reached that cheaper and more profitable cotton farming is on its way to the Delta.

405. LOUISIANA: COTTON RESEARCH, 1942-43. (*Rpt. La. Agr. Exp. Sta.*, 1943. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 153.) A selection from a cross between Miller and Deltapine 2 showed satisfactory staple length and uniformity, excellent lint percentage, and fairly good boll size; yields generally were good. Tidewater and an unnamed variety were crossed in an attempt to produce a long-staple cotton with improved yield. Promising hybrid lines were secured. Selections from crosses between Hopi, a very short-staple variety, and several Upland varieties were in progress. Selections of the hybrid D. and P.L. 829 and Dixie Triumph 425-920 showed improvements in wilt resistance and other characters.

406. HIGHLIGHTS OF THE WORK OF THE MISSISSIPPI EXPERIMENT STATION. By C. Dorman. (*56th Rpt. Dir. Miss. Agric. Exp. Sta.*, 1943. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 153.) The high-yielding strain Delfos 651 is to be released. The strain of Deltatype Webber, designated 2139, has shown promise in several characters.

407. MECHANICAL PRODUCTION OF COTTON. By P. W. Gull and J. E. Adams. (*Miss. Sta. Bull.* 423, 1945. From *Exp. Sta. Rec.*, 94, 5, 1946, p. 669.) The authors report data on results obtained from replicated experimental cultural and harvesting methods used in the production and harvesting of cotton in 1944. Checked or cross-ploughed cotton outyielded drilled cotton, had longer staple, its seed was lower in free fatty acid and higher in grade, and the yarn was stronger and of equal appearance.

Defoliation did not affect the yield or foreign-matter content of seed cotton, the grade of cottonseed, or the spinning value of the lint. It did, however, reduce the moisture content of seed cotton, lint, seed, and the moisture and free fatty content of the cottonseed. Defoliation slightly lowered the grade of hand-picked cotton, but raised machine-picked cotton 0·7 grade. Flaming *v.* hoeing showed no difference in the values obtained on seed cotton, lint, and spinning, but seed produced showed a highly significant difference for free fatty acid and significant difference for grade in favour of flaming. The mechanical cotton picker picked 85 per cent. as much cotton as did the hand pickers, and this seed cotton was materially higher in moisture and foreign-matter content. A reduction of three grades over that produced by hand picking resulted, but fibre length and strength were not affected by the operation. The seed of machine-picked cotton had a higher moisture and free fatty acid content with significantly lower grade than seed from hand-picked cotton. Although the picker and card waste was much greater for machine-picked cotton, spun yarns were stronger and equal in appearance for 22s, 44s, and 60s sizes when compared with hand-picked cotton.

408. NEW MEXICO: COTTON RESEARCH. (*55th Ann. Rpt. of Agr. Exp. Sta., New Mexico Coll. of Agr. & Mech. Arts*, 1943-44. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 161.) A report is given of tests of 12 advanced strains of Acala at two locations. No strain significantly outyielded the standard strain Acala 1517. Significant differences in percentage of 1⅛ inch plus fibres were obtained in both tests. A new strain was isolated in 1943, Acala 5563, which showed good spinning quality.

409. OKLAHOMA: COTTON PROSPECTS, 1946-47. By J. D. Campbell. (*Curr. Frm. Econ.*, xix, 1, 1946, p. 7.) The current problem that may limit cotton acreage is the short supply of planting seed. It is reported that the proportion of cotton seed saved for planting last fall was lower than usual, particularly in the central and eastern parts of the State. Some cottonseed breeders have already sold out of planting seed for the current season, and others are said to have only very limited quantities for sale. Should extensive replanting become necessary, other crops may have to be substituted.

410. SOUTH CAROLINA: REPORT OF COTTON RESEARCH SUB-COMMITTEE ON COTTON DISEASES. By G. M. Armstrong *et al.* (*Cott. Res. Comm.*, 1945. From *Exp. Sta. Rec.*, 94, 6, 1946, p. 777.) This sub-committee of the Southern Experiment Station Committee has prepared for the chief diseases a summary of current research work in progress, an inventory and digest of completed research, and a summary of needs in the light of this information. The sections of this report were prepared as follows: Angular Leaf Spot or Bacterial Blight (W. W. Ray); *Fusarium* Wilt, Root Knot, and Rust (A. L. Smith); *Phymatotrichum* Root-Rot (L. M. Blank and E. W. Lyle); Seedling Diseases (S. G. Lehman); *Verticillium* Wilt (E. M. Cralley).

411. COTTON GINNING EQUIPMENT AND ITS UTILIZATION. By J. M. Stepp. (*S.C. Sta. Bull.* 362, 1945. From *Exp. Sta. Rec.*, 94, 6, 1946, p. 823.) The specific objectives of the analysis described are as follows: To ascertain recent trends in South Carolina with respect to cotton production, the number and size of cotton gins, the use of certain items of ginning equipment, to discover what changes have occurred in the State's relative position in those respects as compared with other cotton-producing States; to analyse thoroughly the physical plant of South Carolina's active cotton ginning industry with respect to buildings, amount, type, and age of ginning machinery, kind of power used, the prevalence of certain items of auxiliary equipment, and total ginning capacity; to investigate the relationships of the above-mentioned factors to each other and to the volume of ginning done by the individual gins, etc.

412. TENNESSEE: COTTON RESEARCH. (*55th and 56th Ann. Rpts. of Agr. Exp. Sta. of Univ. of Tennessee*, 1942 *and* 1943. From *Pl. Bre. Abs.*, xvi, 2, 1946, pp. 156 and 157.) In 1942 hybrid selections from crosses of resistant varieties with susceptible varieties and single-plant progenies of selfed cottons were studied for resistance to *Fusarium* wilt. The cross between 8-66 and 15-612, two inbred lines of Stoneville distinguished by their strength and fineness, gave promising progeny.

In 1943 pure lines were developed of *Fusarium* wilt resistant selections derived from simple and multiple crosses. Numerous inbred lines were under test in comparison with commercial open-pollinated varieties; the most promising lines were combined to obtain the maximum superiority over the open-pollinated varieties.

413. Texas: The Effect of Foreign Matter on the Grade, Staple, and Price of Cotton. By M. A. Grimes. (*Texas Sta. Prog. Rpt.* 954, 1945. From *Exp. Sta. Rec.*, **94**, 4, 1946, p. 553.) The grade, staple, waste, and price were determined before and after cleaning for each of 60 cottons grown in 1941-44 at the station and at Lubbock. The data suggested that efforts should be made either to develop suitable commercial-size equipment to clean lint cotton at the gin, or that the percentage of waste by weight should be determined and duly considered when the cotton is sold. The quantity of cotton within a bale would then be known, there would be fewer bales, with resultant savings on transportation, and the producer would sell and the mill buy a product of higher quality. These changes would necessitate adjustments in the present grading and pricing system.

414. Storm-Proof (Macha) Cotton. By H. P. Smith. (*Sth. Agr.*, **74**, 4, 1944, p. 24. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 208.) Macha cotton is a local Texan selection resistant to wind. It is, however, rather difficult to separate the cotton from the bur during extraction, so varieties intermediate in wind-resisting properties and extractability are being developed by hybridization with typical forms.

COTTON IN EGYPT.

415. Egypt: Cotton Industry, 1946. (*Overseas Rev.*, Barclays Bank, July, 1946.) The month of July has been one of intense activity. Materially increased values have had little effect on the volume of daily sales. 94,500 bales have changed hands, made up as follows: Short staple (Ashmouni and Zagora) 70,500 bales; long staple (Karnak), 17,500 bales; various, 6,500 bales. Included in the above figures are 7,056 bales Old Crop Ashmouni and 17,905 Old Crop Zagora, offered at auction by the Government, which were readily absorbed at top prices. Some shippers had made sales for shipment abroad without having the necessary cotton in hand, and an unexpected rise in prices in America, which was followed here, caused a rush to obtain the cotton to fulfil these engagements. This, coupled with a lack of short-stapled cotton (and to a lesser extent of medium grades of Karnak), caused a sharp increase in values here towards the middle of July, and a more active demand than has been seen for several years. During the month, shipments of importance have been made to England, Italy, France, India, and Spain, and further business has been booked for Sweden, Belgium, India, and Italy.

416. Egyptian Cotton Crop Prospects, 1946-47. (*Cotton*, M/c, 27/7/46.) The Alexandria Commercial Co. reported that conditions in Upper Egypt were normal, but somewhat less so in Lower Egypt, where an attack of leafworm particularly threatened the North district of the Delta. Later the pest was stated to be under control and the position easier.

417. Egyptian Cotton. (*Cotton*, M/c, 20/7/46.) According to reports from Egypt, the quality of cotton grown in Egypt will be more rigidly controlled by a new method developed at the Cotton Research Board Test Mill at Giza. The new system is to be applied to all varieties of the new crop. Termed a "Dated Seed System," the plan calls for the labelling of seed for the Egyptian crop according to the year in which it was issued by the plant breeders at Giza, and after a set number of years seed will not be certificated for sowing. Only certified seed may be sown in Egypt.

418. The Cottons of Egypt. By H. A. Hancock. (*Tech. & Sci. Serv. Bull.* 235A. Min. of Agr., Egypt. 2nd Edn., 1946.) This up-to-date account of the cotton crop of Egypt is compiled for the information of spinners, merchants, and others concerned with the technical aspects of Egypt's major production. A brief account is given of changes in the distribution of varieties during the war, and statistics are presented to show recent acreages by varieties, yields per acre, volume of production, and exports by countries. The spinning qualities and general characteristics of the

cottons now and recently grown are described in some detail, and an estimate is given of the maximum counts spinnable for the different grades. Attention is drawn to the steadily rising grade of the crop in recent years, and the distribution of quantities according to grade is tabulated. Opportunity is taken to show how scientific principles (the application of organized common-sense) are linked with an almost ideal cotton-growing climate and a century's experience in cotton-growing in the effort to reduce costs of production and maintain the highest possible cotton value. The chief control methods adopted by the Egyptian Government for improving the crop are briefly reviewed, with a discussion on the subject of new varieties. Sources of statistics dealing with the Egyptian crop are listed for reference in an appendix, together with the text of the Egyptian Moisture Agreement of 1938.

[*Cf.* Abstr. 93, Vol. XVII. of this Review.]

419. EGYPTIAN COTTONS: DEVELOPMENT AND SPINNING QUALITIES. (*Text. Wkly*, **37**, 1946, p. 858. From *Summ. Curr. Lit.*, xxvi, **11**, 1946, p. 215.) A brief review of the types of cotton now current in Egypt, with special reference to the qualities of Giza 30.

420. PRODUCTION OF COTTON PIECE GOODS. (*Cotton*, M/c, 20/7/46.) The Egyptian Ministry of Commerce and Industry estimates total production of cotton piece goods in 1946 at nearly 40,000 metric tons, or approximately 323,900,000 yards. Domestic consumption is anticipated at about 42,180 metric tons on the basis of 1937 actual consumption and the increase in population since then. This in itself would indicate a deficit of about 2,000 to 3,000 tons, but because of a possible shortage of other textile materials an additional 4,000 tons of cotton piece goods, it is considered, will be needed to supplement the current supply.

COTTON IN OTHER FOREIGN COUNTRIES.

421. ARGENTINE COTTON INDUSTRY, 1945-46. (*The Ambassador*, **7**, 1946, p. 128.) The Argentine cotton industry consumed a record amount of 75,000 tons of cotton during the year ended February, 1946, virtually all of which was grown domestically; thus for the second year in succession the Argentine cotton textile industry practically met the cotton textile requirements of the country. On a fibre equivalent basis Argentina in 1945 actually came close to being a net exporter in contrast with its position as a substantial net importer in pre-war years.

422. MEMORIA ANUAL DE LA JUNTA NACIONAL DEL ALGODON, 1943. (Min. de Agr., Argentina, No. 67, 1943. Received 1946.) A detailed report of the progress made in the cotton industry during the 1942-43 season, and of the measures taken to maintain the improvement. The various sections of the report deal with the following: production; marketing; cotton classification; the textile industry; the work of the Experiment Stations; cottonseed multiplication; technology; labour in the agronomic regions; encouragement of cotton cultivation in new areas, etc.

423. BELGIAN CONGO: REPORT FOR THE YEARS 1942-43. (Publ. Inst. Agron. Congo Belge, 1944. Hors Sér. From *Pl. Bre. Abs.*, xvi, **2**, 1946, p. 145.) *Cotton.*—At Gandajika selected lines of Triumph, the natural hybrid Triumph × U.4, and U.4 have been obtained. Three families of this material have already been distributed under the designations Gar 33 (99-1062), Gar 157 (134-1200) and Gar 203 (U.4/955); they show marked improvement in quality but not in yield. Selection has also been carried out in the following: Ishan × Bambesa Triumph, Ishan × U.4/H, the backcross of Bambesa Triumph × Ishan to Triumph, (Bambesa × Ishan) × U.4/H, open-pollinated U.4/H, and various introduced lines and varieties. The hybrid Ishan × U.4 has been crossed with introduced varieties such as Stoneville, Deltapine, and Lightning Express, and with the most promising station lines. Varietal reaction to *Dysdercus*, which transmits stigmatomycosis, has been studied. It has been found that the insect makes fewer punctures in the rainy season than in the dry season, but that the effect of the punctures in the rainy season is greater. Stoneville 614, 1103, and Big Boll Triumph showed most resistance to the pest, also yielding good-quality cotton. At Bambesa, as in former years, lines derived from Stoneville have shown

most promise. The technique of pedigree selection is described in detail. The F_2 of the following crosses show particular promise: Stoneville×C/55, DPL×H/63, H×DPL, Wilds×DPL, Wilds 5/×H/63, Foster 6/×H/63, and Stoneville×H/63. A year is gained in hybridization work by the practice, introduced in 1943, of sowing the seeds under irrigated conditions in the dry season so that harvesting can be carried out in July. Varieties and lines have been classified for their reaction to *Fusarium vasinfectum*. *Fusarium*-resistant F_2 plants have been secured from crosses of A-6-211 with 145-C-55, 270-D-64, H.A.435 and Stoneville 2. Stoneville has proved to be fairly resistant to stigmatomycosis under conditions of artificial infection. A selection has been obtained at Lubarika which is superior to the varieties used at present in the Ruzizi plain.

424. Cotton Research Work. (*Rapport Ann. pour l'Exercice* 1939. From *Pl. Bre. Abs.*, xvi, **1**, 1946, p. 27.) The chief aim of selection work at Ruzizi is the production of a suitable variety to replace the long-stapled cotton Allen. The variety Lubarika is considered promising and has been distributed on a large scale. This variety has shorter fibre than Allen but a higher ginning percentage. Pedigree selections of Triumph, U.4 and hybrid U.4 at the Gandajika station have shown freedom from *Lygus* attack and an increased fibre length in comparison with mass selections of the same varieties. Natural hybrids of Ishan with a number of other varieties are under observation; controlled hybridization between this variety and Triumph and U.4 has been effected. At Bambesa the lines 145.C.55 and 270.D.64 show particular promise. Selections of Farm Relief have satisfactory fibre length but are inferior in yield to the Bambesa strains; this variety has been used in hybridization work. From a selection of Ishan two distinct groups of lines have been produced. F_6 lines of Triumph Big Boll×Acala have shown high yields and ginning percentage, and also satisfactory fibre length. F_2 hybrids of Triumph selections crossed with Lightning Express, Farm Relief and S.G.29 are under observation. At Yangambi indication has been obtained of a positive correlation between resistance to *Dysdercus* and the thickness of the inner wall of the boll. Selection for resistance to wilt (*Fusarium vasinfectum* and *Verticillium dahliae*) and stigmatomycosis is in progress.

425. Notes au Sujet de la Culture du Coton dans le Congo-Ubangi. By C. Leontovitch. (*Bull. Agr. du Congo Belge*, Nos. 1-4, 1940, p. 125.) The advantages of sowing cotton under the shade of maize, followed by a mulch of dead leaves and weeds, are discussed.

426. Brazil: Cotton Output Down. (*The Ambassador*, **5**, 1946, p. 118.) Cotton production in Brazil is now declining, after increasing appreciably during the war years; this is due to the concentration of agriculture on cereal crops. Indications are that the 1945-46 crop will show a decline of 30 per cent. from the 1944-45 total.

427. Brazilian Textile Industry. (*Cotton*, M/c, 20/7/46.) A report issued recently by the General Secretary of the Syndicate of Spinning and Weaving Industries in Rio de Janeiro stated that the suspension of exports of cotton textiles had been widely debated, not only on account of its effect on business already closed, but also because of the desirability of not interfering with the continuity of sales abroad. It was pointed out that Brazil's annual production of textiles was normally about 1,200 million metres, whereas home consumption was from 900-1,000 million metres, so that there was thus a surplus to be placed abroad each year. The report commented upon the fact that the importance of the textile industry in Brazil's economy was much greater than was generally realized and that any development tending to upset its structure would adversely affect national revenue from taxation. Moreover, in four years exports of textiles had brought in Cr\$4,000 millions (approximately £50,000,000) for Brazil, whilst the industry gave support to a number of subsidiary activities. It was also stated in the report that the bulk of the textile machinery in Brazil was very much out of date, and that, according to expert opinion, the mills needed to be completely reorganized in the spinning departments in order to produce yarn of the resistance required to work with automatic looms. An increase in output by the use of improved machinery was stated to be the solution of the labour problem in the textile industry.

428. COTTON TEXTILE MACHINERY. (*Cotton*, M/c, 22/6/46.) In the course of a recent Press interview the President of the Textile Executive Committee expressed himself as opposed to the import of used or reconditioned textile machinery, inasmuch as the use of such machinery would prevent the Brazilian cotton industry from competing in foreign markets with cotton goods produced by other countries, and would not make it possible to improve the working conditions of Brazilian operatives. Moreover, the output of such machinery was usually of lower quality and higher cost compared with that of new machinery. The same official declared that the cotton mills had already taken steps to purchase new machinery, in which connection orders representing a total value of Cr$1,600 millions had been placed in Great Britain and the U.S.A.

429. SÃO PAULO COTTON. (*Cotton*, M/c, 20/7/46.) A report for June states that the price of São Paulo type 5 cotton reached a new high record at Cr$152 per 15 kilos. The Belgian Trade Mission which visited the country recently is said to have shown considerable interest in the purchase of Brazilian cotton. France, also, is reported to have made an offer for 40,000 tons of Paulista cotton.

430. CHINA: FORMER JAPANESE-OWNED COTTON MILLS. (*Cotton*, M/c, 20/7/46.) Former Japanese-owned cotton-spinning mills in China, which were taken over by the Chinese Government after the war, are reported to be operating at about 10-20 per cent. of capacity. The mills are under the management of the China Cotton-Spinning Construction Co., but owing to a shortage of raw materials this organization has found it difficult to increase the operations. It is planned to sell the mills to civilians after two years of Government control. The mills are in good condition, since there was no destruction of machinery at the time the Chinese Government took over control, and no machinery was removed.

431. SHANGHAI COTTON MILLS. (*The Ambassador*, 5, 1946, p. 114.) The rehabilitation of the Shanghai textile industry, which before the war gave employment to about 750,000, is proceeding at a slow pace; adverse factors include an acute shortage of raw materials, a dearth of skilled labour, and the need for new capital investment. The Japanese occupation of Shanghai has been a period of disintegration, recovery from which will take some time. When Japan gained control of the region in 1937 she seized most of the textile mills; only those in the International Settlement and the French Concession, or which claimed United States or British ownership, escaped; with the declaration of war on the Allies, these remaining plants were also taken over, with the exception of those controlled by Chinese who declared allegiance to the Nanking puppet government. During the years which followed nearly all orders placed went to Japanese-controlled firms, so that by the autumn of 1944 less than 3 per cent. of the Chinese-owned textile mills of Shanghai were in production. These mills mostly manufactured cotton. . . . During the war Chinese factories were practically cut off from all supplies of raw cotton, and sources of supply even to Japanese-controlled mills were very restricted. With the Indian market cut off, it is estimated that the Japanese shipped only 130,000 bales of cotton into Shanghai during 1944 and 1945. In November, 1945, the mills were estimated to have less than one week's supply of cotton (a maximum of 20,000 bales) available. . . . Current cotton crops have been small, and are insufficient to supply the raw material demand. One point to be stressed, however, is the recuperative power of the Chinese race. Given political stability and peace, their desire to rebuild the damaged industries of their land will be readily translated into action.

432. CZECHOSLOVAKIA: NATIONALIZED TEXTILES. (*Man. Guar.*, 27/8/46.) Under the nationalization scheme which has just been completed in Czechoslovakia 136 textile producers have been amalgamated into 29 national concerns. The industry will be operated according to a production plan to be directed from one centre, a proposal which was approved at a recent meeting of the Czechoslovak Textile Institute at Brno. . . . According to reports recently received, the need for re-equipment, the labour shortage, and difficulties in importing raw materials are the industry's most serious bottlenecks. The need for more automatic machines, particularly looms, is urgent. . . . As a result both of the occupation and of the

transfer of the Sudeten Germans, the number of textile workers has declined from 275,000 before the war to 100,000. A labour force of some 175,000 is considered to be the industry's minimum requirement, but owing to the competing demand for labour from other industries it will be difficult to reach this figure. Efforts to increase output per worker will therefore be made. It is reported that six new training centres for textile labour are to be set up, and a research institute is to be established which will assure a regular flow of research workers to the industry. The bulk purchasing system of raw materials, which has been practised since the country's liberation, is being continued.

433. JAPAN: THE TEXTILE INDUSTRY. (*Cotton*, M/c, 27/7/46.) The report of the textile mission to Japan in the first quarter of this year, which was sponsored by the U.S. State and War Departments, has been issued as a White Paper. It is stated that Japan's four major textile machinery manufacturers, who account for approximately 75-85 per cent. of new machinery production, have the capacity to produce 290,000 spindles and 11,300 looms this year and over 785,000 spindles and 16,800 looms next year. The extensive equipment remaining in the hands of these four producers is far in excess of what was necessary even in pre-war years to satisfy Japan's textile requirements. At the end of February, the report states, Japan had stocks of 575,000,000 square yards of cloth, and raw materials and yarn sufficient to produce an additional 425,000,000 square yards. The mission found no direct evidence of undue clothing shortage in Japan in comparison with other countries.

434. COTTON SPINDLES IN OPERATION. (*Cotton*, M/c, 13/7/46.) Japan is estimated to have received 170,000 bales of American cotton up to the middle of June, 1946, and is in the process of clearing the remainder of 650,000 bales which have been selected from CCC stocks. General MacArthur estimates that Japan will need at least 890,000 bales before the year is over. There are now 2,200,000 spindles in operation, compared with 13,400,000 spindles before the war, and plans are under way to bring enough obsolete or damaged machinery out of storage to piece together a total of 3,500,000 within the next year. Material allocations will not permit the production of additional textile machinery, and it is considered that it will be 1948 before the total number of operating spindles can be brought up to 4,500,000. On June 1 Japanese mills were reported to have reached a consumption rate of 3,000,000 lb. of cotton per month, and had on hand a sufficient supply to last them for two months with CCC cotton just beginning to arrive.

435. MEXICO: A TROPICAL WINTER-PLANT BREEDING STATION ENABLING TWO FIELD GENERATIONS A YEAR. By H. H. Webber. (*J. Amer. Soc. Agron.*, **37**, 1945, p. 859. From *Pl. Bre. Abs.*, xvi, **2**, 1946, p. 207.) A cotton-breeding station has been established under tropical conditions in Southern Mexico with the purpose of obtaining a winter crop of American Upland cottons in addition to the usual summer crop in Texas, thus shortening the period necessary in selecting for quality.

436. RUSSIA: COLOURED COTTON OUTPUT. (*The Ambassador*, **6**, 1946, p. 127.) Recent specimens of coloured cotton from Uzbekistan included fibres in twenty shades of green, brown, yellow, pink, dark and light grey, and light blue. The cotton is said to be equal in quality to the finest Egyptian and American fibre, and sometimes even superior in harvest yield and technical qualities. Cloth made from it is said to be very durable, and not to fade in the sun or wash. Cotton cultivation in the Soviet Union, together with that of several other crops, will in future be the special concern of the newly created Commissariat of Industrial Crops Cultivation.

437. SOVIET BIOLOGY. By A. R. Zhebrak. See Abstract 486.

438. TURKMENISTAN EXPERIMENT STATION OF THE ALL-UNION INSTITUTE OF PLANT INDUSTRY. By — Petrov. (*Vestnik Soc. Rastenievodstva*, **5**, 1940, p. 188. From *Pl. Bre. Abs.*, xvi, **2**, 1946, p. 141.) The work is concerned at present with the study of both wild plants and crops in various localities with a view to producing varieties suited to the mountainous districts of the republic. Collections have been made of fruits, vines, long-stapled cotton, cereals and ornamental evergreens. Sea Island cotton from Trinidad is used for breeding. In 1933 this variety, in spite of frosts and other unfavourable weather conditions, gave a high yield of good quality, and

in 1938 valuable constant, early lines were obtained. Lines 1661 and 1665 had a staple length of 47-53 mm., with a boll weight of 3-4 grm., a lint output of 23-31 per cent., a vegetation period of 151 days, and a cotton yield of 80-100 per cent. gathered before the frost.

439. The Effect of Puncturing and Sucking Insects on the Shedding of the Fruits of Cotton. By N. I. Demidov. See Abstract 503.

440. Turkey: Cotton Production, 1945. (*Int. Rev. Agr.*, xxxvi, 11 and 12, Rome, 1945, 179S.) Owing to the severe drought experienced during the 1945 cotton year, the production of ginned cotton is estimated at 166,000 bales, compared with 221,000 bales in 1944. In future preference will be given to the cultivation of the American Acala variety of cotton.

SOILS, SOIL EROSION, AND FERTILIZERS.

441. Bibliography of Soil Science, Fertilizers, and General Agronomy, 1940-44. (Imperial Bur. Soil Science, Harpenden, England, 1946. Price: 30s. net. Copies obtainable from Imperial Agricultural Bureaux, Central Sales Branch, Penglais, Aberystwyth, Wales.) Contains over 7,000 classified references, together with subject and author indexes, a list of the journals from which the references were made, and a key to the classification numbers used (Universal Decimal Classification). The Bibliography also serves as a cumulative index to the Bureau's abstract journal "Soils and Fertilizers." The references are compiled from those abstracted in "Soils and Fertilizers," Vols. IV to VII, and the numbers in the margin of the Bibliography indicate the number of "Soils and Fertilizers" in which an abstract of the paper referred to will be found. Absence of a marginal number indicates that the paper, though noted, was not abstracted.

[*Cf.* Abstrs. 646, Vol. XV, and 89, Vol. XIX. of this Review.]

442. Soil-Fertility Maintenance under Different Systems of Agriculture. By H. L. Richardson. (*Emp. J. Exp. Agr.*, xiv, **53**, 1946, p. 1.) In examining the maintenance of soil fertility under different systems of agriculture reliance is placed on three different methods viz., (1) natural recuperation, supplemented by water-borne silt on alluvial plains, and including the "mining" of the initial fertility of the soil where virgin soils are brought under cultivation; (2) the use of local manures, chiefly animal and other organic manures, ashes, and lime, to supplement natural recuperation; (3) the use of inorganic fertilizers to supplement local manures and natural recuperation. The first method maintains fertility at the lowest level; the second at a moderate level; and the third at the highest level. This last method is the only one that has produced any marked increases in the fertility of infertile soils. The first method is exemplified in most primitive and traditional agriculture, including much peasant farming, and also in modern extensive agriculture; the second method is shown by the traditional agriculture of China and Japan, and the peasant farming of some European countries, especially those around the Mediterranean (where, however, inorganic fertilizers are increasingly coming into use as well); the third method is best seen in the modern intensive agriculture of N.W. Europe, in New Zealand, and for some crops in the eastern United States. It is also employed in the most advanced forms of plantation agriculture. In some localities reliance is placed on the use of inorganic fertilizers alone, but under most systems of modern intensive agriculture organic manures also play a part, usually either farmyard manure, ley farming, or green manuring.

443. Soil Management and Plant Nutrition in Relation to Disease Development. By J. C. Walker. See Abstract 483.

444. Volatile Soil Fumigants for Plant Disease Control. By A. G. Newhall. (*Soil Sci.*, **61**, 1, 1946, p. 67. From *Exp. Sta. Rec.*, **94**, 6, 1946, p. 770.) In this review (14 references) the need is stressed for a cheap method of eradicating pathogenic organisms, especially nematodes, from field soils—a need which promises one day to be met by use of volatile fumigants injected beneath the soil surface. The requirements of the ideal soil fumigant are outlined, and methods of testing are

described. Factors influencing the effectiveness of any given materials are discussed, with special reference to chloropicrin. Data on the nemacidal effectiveness of several of the better known soil fumigants are given, including chloropicrin, CS_2, DD mixture, ethylene dichloride, and methyl bromide. The evolution of machinery designed to apply such fumigants is outlined, and some of the unsolved problems in the field are discussed.

445. A Review of the Literature on Soil Insecticides. By H. C. Gough. See Abstract 454.

446. Studies on Compost. Influence of Addition of Soil on Carbon and Nitrogen Economy during Composting. By C. N. Archarya, *et al.* (*Ind. J. Agr. Sci.*, xv, 4, 1945, p. 214.) Mixed refuse containing weeds, leaves, grass, straw, and cattle dung, having a C/N ratio near 32:1, was composted aerobically in jars, under controlled conditions, with and without the addition of garden earth. The refuse composted without the addition of earth lost nearly 23 per cent. of its initial nitrogen in a period of 20 weeks. The loss appeared to occur in two stages: there was an initial period of rapid loss, which covered the first week of decomposition; this was followed by a longer period of slow and steady loss, along with the progressive decomposition of the refuse. The loss of nitrogen was overcome by the addition of earth to the compost mass, the over-all result being a slight gain in total nitrogen, due to fixation from the air. Parallel with the increased conservation of nitrogen secured by addition of soil to decomposing refuse there was an increased recovery of carbon and of organic matter in the final manure. The C/N ratio of the compost narrowed down quicker in cases where soil had been added to the refuse. Probable explanations are offered for: (*a*) the considerable losses of nitrogen taking place from mixed refuse of C/N ratios wider than 30:1; (*b*) the beneficial effect of earth in controlling such nitrogen losses; and (*c*) the relations between recovery of carbon and of organic manure on the one hand and of nitrogen economy during composting on the other.

447. Compost Manure from Town Wastes. See Abstract 365.

STATISTICAL TREATMENT, CULTIVATION, GINNING, USE OF SEED.

448. The Advanced Theory of Statistics. By M. G. Kendall. (Chas. Griffin and Co. Ltd., London, 1943, Vol. I, 42s. Reviewed *Pl. Bre. Abs.*, xvi, 2, 1946, p. 245.) The author is already known for his part in the revision of Yule's classic "Introduction to the Theory of Statistics," issued in 1937 under joint authorship as the eleventh edition of that work, and also for his own contributions to the theory of statistics. The new work develops a systematic treatment along mathematical lines of the theory as it exists at present, and while a complete appraisal must await the appearance of the second volume, it may be said that this first volume, which is complete in itself up to the stage selected for a break between the two volumes, is a fully authoritative exposition which at once has taken an honoured place in the literature of a subject in which the present half-century has seen such a remarkable development. Not the least of the author's successes has been the synthesis of the work of foreign mathematical statisticians with that published in English. The references are fairly numerous, but it is understood that a more complete bibliography will be issued with the second volume.

The ground covered is the standard field ranging from probability and the study of frequency distributions up to correlation (simple, partial, multiple, and rank), and is varied only by the somewhat unusual deferment of a formal study of probability and likelihood until after the various standard distributions, and their properties, have been described. Although the field is standard, the treatment is new in that it is formally mathematical throughout. In particular there is a chapter on characterization functions, developing a powerful method not only for the alternative description of a frequency distribution, but also for the evaluation of many exact sampling distributions, although these are not developed as fully as they might be,

e.g., to the distribution of the second order moment about the sample mean, or to that of the joint second order moments for a two-variable distribution, including the distribution of the estimated covariance. A valuable part of the book is the series of examples given together with the exercises with which the chapter closes. Many of these latter are extensions of theory quoted from papers, and are designed doubtless to stimulate a wider reading in this field.

449. LAND CLASSIFICATION FOR LAND-USE PLANNING. By G. V. Jacks. (*Tech. Commn.* 43. Publd. by Imp. Bur. of Soil Science, Harpenden, England, 1946. Price: 4s. post free. Copies obtainable from Imperial Agricultural Bureaux, Central Sales Branch, Penglais, Aberystwyth, Wales.) Land classification must form the basis for the planned utilization of land. Interest in land-use planning as a means of avoiding the economic disasters that overwhelmed agriculture before the war, and the land deterioration that resulted from faulty land use, and, on the international scale, of securing a better balance between the supply of and demand for agricultural products, has become world-wide. Yet the science of land classification is still in its infancy. It is essential that everybody engaged in land-use planning, whether in the field or in the office, should know the basic principles of land classification so far as they have been developed, what the classifier aims to do, what factors geographical, social and economic—are involved, and what are the limitations of land classification. These matters are discussed in the present publication, which summarises the published literature on land classification in so far as it concerns the planning of agricultural and forest land. Besides reviewing general principles, numerous examples are described of actual systems of land classification, and a section is devoted to the several schemes for quantitatively expressing soil productivity, known as " productivity ratings " in America and *Bodenbonitierung* in Germany.

The following are the headings of the various sections: Land Classification and Land-Use Planning; Types of Land Classification; The Physical Classification of Land; Land Inventories; The U.S. Soil Survey; Land Types and Soil Types; Land-Use Classes; Agricultural Regions; The Use of Natural Vegetation as an Indicator of Land Quality; Systems of Land Classification; The Estimation of Productivity. A bibliography of 99 names is included.

450. THE ECONOMICS OF COTTON GIN OPERATION. By D. G. Miley and A. L. Roberts. (*Bull.* 421, Miss. Agr. Exp. Sta., 1945.) Complete cost and grade information was obtained from 50 gins in 4 counties in central Mississippi and 42 gins in 4 counties in north Mississippi. On the basis of detailed appraisal information, all gins were grouped according to whether they were modern, average, or sub-standard in the type and condition of gin machinery and equipment. The 92 gins handled a total of 122,647 bales during the 1944 season, or an average of 1,333 bales per gin. The 23 modern gins had an average volume of 1,926 bales per gin compared with an average of 960 for the 30 sub-standard gins. The average age of the modern gins was 8 years compared with an average of 18 years for the sub-standard group. The estimated replacement value of the 92 gins is slightly under two million dollars, or an average of $21,703 per gin. The present value, however, averaged only $11,948, or 55 per cent. of the replacement value. After allowing for all current expenses, salary for management, depreciation, and interest on the investment, the average gin in 1944 returned a net profit of $491 on the ginning operation. For the modern gins the profit was $1,227 and for the sub-standard group the average was only $7. In addition, all ginners had the profit from the handling of cottonseed and bagging and ties, which amounted to an average of $1,893 and $317 respectively. When all items were included, the modern gins had a total net profit of $4,327 and the sub-standard gins $1,497. The average cost of ginning a bale of cotton was $3.10. The average gin income was $3.46 per bale, thus leaving a net profit of $0.36 per bale. The net profit from the handling of seed and bagging and ties increased the average total net profit to $1.96 per bale for the 1944 season. The range in total net profit was from an average of $2.25 per bale for modern gins to $1.46 per bale for sub-standard gins. It required an average of 2·9 hours of man labour to gin each bale of cotton. The 40 gins that used Diesel engines as a source of power used an average of 1·6 gallons of

Diesel fuel per bale. Electrically powered gins used 19 kilowatt hours of electricity for each bale. Ten other fuel burners used 3·3 gallons of tractor fuel or fuel oil per bale, while 9 gasoline powered gins used 3·1 gallons of gasoline for each bale. . . . Cotton driers have a decided effect on ginning preparation. Those gins using driers had 3·7 per cent. rough preparation compared with 6·8 per cent. rough preparation for gins not having driers. Little difference existed in the density of seed rolls maintained by the various groups of gins. However, those gins using tight seed rolls were all in the average and sub-standard groups. Modern gins maintained considerably higher saw speeds than did either the average or sub-standard groups. Saws and ribs on the modern gins were in good to fair condition, while several of the average and sub-standard gins had saws and ribs in poor condition. . . . The average value of lint turned out by gins having both saws and ribs in good condition was 22·22 cents per pound. That turned out by gins having either or both saws and ribs in fair to poor condition had an average of 22·13 cents per pound.

[*Cf.* Abstr. 377, Vol. XXII. of this Review.]

MACHINERY.

451. Cotton Harvester. By L. E. Nickla and A. R. Crawford. (*Text. Tech. Digest*, 3, 1, 1946, p. 2.) The blower in a pneumatic conveyor system for cotton harvesting machines is constructed so that the blades of the rotor do not strike the cotton and so cannot break the seeds. The loss of oil from the seeds, and consequent loss in grade of the cotton because of oil stains, is, therefore, prevented and the cotton is efficiently transferred to its receptacle attached to the harvester.

PESTS, DISEASES, AND INJURIES, AND THEIR CONTROL.

452. An Experimental Hygrochamber for the Study of the Reactions of Insects to Humidity. By N. P. Sokolov. (In Russian. *Izv. uzbek. Fil. Akad. Nauk. U.S.S.R.*, 1940. From *Rev. App. Ent.*, xxxiv, Ser. A, 5, 1946, p. 154.) The author describes and illustrates an apparatus in which insects can be exposed to a gradient of atmospheric humidity. It consists of an air-tight box of metal and glass 92 cm. long, 4·2 cm. high, and 10 cm. wide, in the floor of which are seven cavities that contain petri dishes and hygrometers, arranged alternately and at equal intervals. The dish at one end contains distilled water and the other three the requisite amounts of sulphuric acid or calcium chloride, and a gradient of 10-94 per cent. relative humidity is thus obtained. The insects are introduced through one end. The hair hygrometers employed were specially designed by N. V. Il'inskii for use in the apparatus and are also described and illustrated. Tests with mosquitoes showed that the chamber was satisfactory in practical use.

453. Spray Chemicals and Application Equipment. A Textbook and Handbook of the Insecticide-Fungicide Industry and of Application Equipment. By J. A. McClintock and W. B. Fisher. (La Grange, Ind., Horticultural Press, 1945. Price $4. Abroad $5. From *Rev. App. Ent.*, xxxiv, Ser. A, 5, 1946, p. 151.) The first part of the book comprises information on the historical development, chemistry, manufacture, toxic properties and uses of the various compounds employed in pest control, mainly but not exclusively in sprays, and includes some previously unpublished data on manufacturing processes. In the second (pp. 193-303) the various types of spraying and dusting equipment are briefly described and their advantages and disadvantages summarized. The book is illustrated with numerous photographs of manufacturing plant and processes, the application of various insecticides, and types of equipment made by different manufacturers.

454. A Review of the Literature on Soil Insecticides. By H. C. Gough. (Imp. Inst. of Ent., London, 1945. Price 10s. From *Pl. Bre. Abs.*, xvi. 2, 1946, p. 252.) A critical review of the literature on soil insecticides, prepared at the request of the Agricultural Research Council of the United Kingdom, chiefly covering the period 1914-1940. In order to reduce the amount of material to be examined to manageable proportions, the scope of the review is strictly limited to soil insecti-

cides. Thus, all reference to the Nematoda is omitted; the control of the Myriopods and Arachnids is, however, included. The main part of the work is alphabetically arranged under chemicals, and within chemicals under insects, one section being devoted to the most important chemicals and another to the less important substances tested. A section deals with general problems, such as methods of application and the experimental methods of assessing the toxicity of soil insecticides. In view of the scattered nature of much of the information on the subject this review is particularly useful.

455. Compatibility of DDT with Insecticides, Fungicides, and Fertilizers. By E. E. Fleck and H. L. Haller. (*Industr. Eng. Chem.*, **37**, 1945, p. 403. From *Rev. App. Ent.*, xxxiv, Ser. A, **5**, 1946, p. 157.) The results are given of tests of some of the more common insecticides, fungicides, and fertilizers for catalytic action in the dehydrochlorination of DDT. Commercial grades of sodium fluoride, sodium fluosilicate, cryolite, Paris green, calcium arsenate and lead arsenate showed no catalytic activity in decomposing DDT, and pure rotenone and pyrethrum were also inactive, but pure nicotine caused decomposition to 2,2-bis-(parachlorphenyl)-1-1-dichlorethylene, which is much less effective as an insecticide. Commercial lime-sulphur and 2,3-dichlor-1,4-naphthoquinone showed no catalytic action, but mixtures of DDT with ferric dimethyl dithiocarbamate, Bordeaux mixture or sulphur resulted in the evolution of small quantities of hydrochloric acid. Accessory materials of mineral origin that may be used in the preparation of DDT dusts or be encountered in its manufacture or use were also tested, and it appeared that differences in the activity of samples of the same mineral may be due to the presence of small amounts of catalysts irregularly distributed in it. Active catalysts known at present include iron and iron oxides, chromium and anhydrous ferric aluminium, and chromic chlorides. Tests in which anhydrous ferric chloride was mixed with solutions of DDT showed that most of the solvents used for this compound, including various hydrocarbon and fatty oils, alcohols, ketones, acids and anhydrides, have a marked inhibiting action towards the catalytic decomposition reaction, the notable exceptions being naphthalene, α-chlornaphthalene and the nitro- and chlor-benzenes.

456. Could the Widespread Use of DDT be a Disaster? By E. H. Strickland. (*Ent. News*, **56**, 4, 1945, p. 85. From *Rev. App. Ent.*, xxxiv, Ser. A, **5**, 1946, p. 146.) In view of a statement that many species of insects were almost completely eliminated over an area of 20 acres of forest land in Pennsylvania by treatment with DDT, the author points out the risks that may be associated with the use of this insecticide over large areas. If a pest were eliminated by DDT, its parasites would either be destroyed with it or would die out for lack of food, since any alternative hosts they might have would presumably also have been eliminated. In subsequent years the pest would invade the treated area from outside, and could then increase unchecked, as it is unlikely that its parasites would accompany it in sufficient numbers to exert control, since they are in flight at different seasons of the year. Furthermore, outbreaks of insects that are not normally pests, because they are controlled by parasites, might well occur for the same reason and necessitate the frequent application of control measures not previously required.

457. DDT Compared with Other Insecticides for Control of Hemipterous Insects on Cotton. By W. A. Stevenson. (*Jour. Econ. Ent.*, **38**, 5, 1945, p. 531. From *Exp. Sta. Rec.*, **94**, 5, 1946, p. 641.) Because of the need for a better insecticide against this complex group of pests and the high effectiveness shown by DDT in cage tests, several comparative experiments were carried out in the field, with promising results. In hand-dusting tests of five insecticides—some used at different strengths—each treatment was followed by significant control of injurious insects over the checks; DDT plus sulphur, however, resulted in significantly better control and a higher cotton yield than any of the sulphur arsenicals used. Airplane dusting at weekly intervals—July 11-August 28—gave a seasonal reduction of over 57 per cent of the injurious species. In a late-season airplane dusting test in the presence of low insect populations the treatment did not pay. In a power-machine dusting experiment—seven applications, June 18-August 9—the insecticides proved less

effective in reducing insect populations, but the DDT mixtures were slightly more so than the others.

458. Resistance of Species and Varieties of Crop Plants to Insect Pests. By P. G. Cesnokov. (In Russian. *Soviet Pl. Indus. Rec.*, **3**, 1940, p. 131. From *Pl. Bre. Abs.*, xvi, **2**, 1946, p. 174.) A review of the subject with citations of the results of various workers, dealing with (1) the terminology of insect resistance; (2) the diversity and classification of the phenomena conditioning degrees of resistance of species and varieties of agricultural crops to insect damage; (3) absence of damage to plant forms (*a*) as a result of selective action of the pest, and (*b*) even when infestation occurs, and passive and active resistance (immunity) of the host in such cases; and (4) tolerance of species and varieties. There is a bibliography of 66 works in English, Russian, and German.

459. DDT for Bollworm Control during 1944. By E. E. Ivy *et al.* (*Jour. Econ. Ent.*, **38**, 5, 1945, p. 534. From *Exp. Sta. Rec.*, **94**, 5, 1946, p. 641.) In cage tests with third-instar bollworms, 4 and 2 per cent. DDT proved more effective and 1 and 0·5 per cent. less so—each at 16 lb. per acre—than calcium arsenate at 8 lb. per acre. At 16 lb. per acre, 4 per cent. DDT was more effective than a 1 : 1 basic copper arsenate-sulphur mixture or lead arsenate and cryolite at 8 lb. A high poundage of a low concentration of DDT was better than a low poundage at a higher concentration. Immediately after application DDT was about equally effective as a dust or spray, but after four applications and a 0·46-in. rain the residual action of the spray was slightly greater. In a field test with randomized small plots and three dustings at about 16 lb. per acre application, the gains in seed cotton per acre were 320 lb. with 8 per cent. DDT, 273 with calcium arsenate, 238 with 4 per cent. DDT, 154 with 2 per cent. DDT, and 148 with 1 per cent. DDT. In a large-plot experiment where four dustings were made at 5-day intervals at the rate of 16 and 15 lb. per acre application, the gain from 4 per cent. DDT was 736 lb. and from calcium arsenate 688 lb.

460. Report of the Chief of the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, 1943-44. By P. N. Annand. (U.S. Dept. Agr., Washington, D.C., 1945. From *Rev. App. Ent.*, xxxiv, Ser. A, **6**, 1946, p. 175.) *Cotton Pests.*—The artificial defoliation of cotton by dusting the plants with calcium cyanamide as a measure against the boll weevil and other injurious insects again gave satisfactory results. The addition of nicotine to calcium arsenate dusts applied against boll weevil in order to prevent the increase of aphis (*Aphis gossypii*) that they cause increased the yield of seed cotton in Mississippi, Louisiana, and Texas. In general, free nicotine, nicotine sulphate, and several fixed nicotines were equally effective for equal amounts of actual nicotine. and control was satisfactory when the dusts were applied from aircraft or by ground equipment at any time during the day or night at which atmospheric conditions were favourable. Synthetic materials, including DDT, thiocyanates, phenothioxin, and dinitro-o-cyclohexylphenol, did not give promising results against this aphid. Cotton on fertile Delta soils tolerates aphid populations as high as 60 per square inch of leaf surface in wet years, but in 1943, under dry conditions, populations of only half this size caused premature leaf-fall, and much lighter populations caused defoliation on drier soils. Two winters favourable for hibernation have resulted in an increase of the pink bollworm in the lower Rio Grande Valley, and the larvæ were about twice as numerous on cotton in the spring of 1944 as in 1943. Of larvæ in open bolls caged on August 16, September 18, and October 19, 0·75, 7·93, and 32·05 per cent. respectively survived, and of those in bolls on standing stalks, on the soil surface, and in the soil at a depth of 4-6 in. 26·44, 11·75, and 2·54 per cent. did so. The larvæ evidently do not overwinter in free cocoons in the soil in this region. Infestation in the Big Bend area was favoured by high rates of survival during the winters of 1941-42 and 1942-43 and the longer planting period permitted in 1943 by the removal of legal restrictions, but was checked by the use of early-maturing varieties, the early cessation of irrigation, and the removal of crop remnants after harvest. Where planting and irrigation were late, many long-cycle larvæ

were produced and the number of larvæ entering hibernation was twice as great as in 1942. Observations with an instrument that measures soil humidity without disturbing the soil indicated that two or more irrigations separated by an interval in which the soil can dry out are necessary for successful pupation and adult emergence. In the field a few moths emerge after the pre-planting irrigation, but others do not appear until after the first or second irrigation of the cotton, when squares and bolls are present. D-D (a mixture of dichlorpropylene and dichlorpropane) applied at the approximate rate of 50 U.S. gals. per acre killed 81-100 per cent. of the larvæ in buried cotton bolls when injected into the soil to the same depth as the larvæ at points about 19 in. apart, or when added to the irrigation water, but not when sprayed on to the surface of the soil after the bolls had been buried. The larvæ were recorded for the first time over-wintering in the seed-pods of *Pseudabutilon lozani*; infestation in secondary food-plants was correlated with their time of fruiting and the intensity of infestation on cotton. Although survival of the cotton bollworm (*Heliothis armigera*) was high and oviposition heavy at the beginning of the season, damage was greatly reduced by subsequent high temperatures and natural enemies. At the same rate of application, a dust of cryolite diluted with 15-30 per cent. sulphur was as effective against the larvæ as undiluted cryolite, probably because of its better dusting qualities and power of coverage; greater dilutions were also effective, provided that the cryolite was applied at the rate of 8 lb. per acre. A dry-mixed bait of cryolite and maize meal (1 : 9) applied at rates of 40, 60, and 80 lb. per acre gave satisfactory control; when it was applied by hand, even at the lowest rate, it covered the plants well and yields were equal to those from plants dusted with 8 lb. cryolite per acre. Two years' tests showed that control of *H. armigera* is increased by applying insecticides at rates higher than the usual 8 lb. calcium arsenate per acre. The respective increases in yield of seed cotton in lb. per acre were 173, 187, and 195 for calcium arsenate applied at rates of 8, 12, and 16 lb. and 195 and 300 for mixtures of basic copper arsenate and sulphur in the proportions of 1 : 2 and 1 : 1, both applied at the rate of 16 lb. Basic copper arsenate applied as a spray at the rate of 8 lb. per acre is stated to have been as effective as the 1 : 1 mixture or as calcium arsenate at 16 lb. Calcium arsenite was more toxic to the larvæ than calcium arsenate, but is too injurious to the plants for general use. A dust of dinitro-o-cyclohexylphenol and sulphur (1 : 9) was less effective than calcium arsenate, and one of phenoxathiin (phenothioxin) and bentonite (1 : 1) was of little value.

461. THE EFFECT OF PUNCTURING AND SUCKING INSECTS ON THE SHEDDING OF THE FRUITS OF COTTON. By N. I. Demidov. See Abstract 503.

462. JASSIDS IN COTTON. (*Ind. Frmg.*, vii, 2, 1946, p. 83.) A study of the jassid (*Empoasca devastans*), a major pest of American and other cottons in India, given under the following headings: Insect infestation; Jassid-resistant varieties; Incidence of the insect; Universal symptoms; Time of sowing and jassid incidence; Jassid incidence in rain-fed and irrigated tracts. Extensive investigations on the insect by the Cotton Botanist in the Punjab have shown that in jassid-susceptible varieties of cotton infestation by the pest causes reduction in growth of the main stem, in the number of flowers and bolls produced, and also affects the quality of the lint. Since control by chemical means under field conditions is neither practicable nor economical, breeding for jassid resistance appears to offer the only hope of combating the pest.

463. A MEASURE FOR REDUCING DAMAGE TO COTTON BY JASSIDS. By R. H. Dastur. (*Ind. Frmg.*, vii, 3, 1946, p. 124.) The following conclusions are presented: The effectiveness of close spacing in reducing damage by jassids is not only of real practical value but is also of great scientific interest. This observation is in contradiction to the general belief that a thick crop would be liable to greater damage by insect pests than a thin crop. It is nevertheless a fact borne out by repeated experiments in different parts of India. It appears that this fact has not been reported before. With the present knowledge it is difficult to explain the mechanism by which a closely spaced crop tends to withstand the attack of jassids while a widely spaced crop sown on the same date succumbs to it. It is very likely that light plays

some important rôle in the life history of the insect, and consequently the attack does not persist long in the closely spaced crop, which more or less covers the soil by the time the insect appears. The above view is based on the following observations: (1) The insect is attracted to light, and (2) under the shade of trees and hedges the attack is less pronounced. Presumably, therefore, for want of sufficient light in close spacing the environment becomes less favourable for the multiplication and attack of the pest.

464. QUEENSLAND: COTTON JASSID. (*Ann. Rpt. Dpt. Agr. & Stock*, 1944-45. Received 1946.) The cotton jassid, *Empoasca maculata*, Ev., is a major pest of cotton, particularly in seasons when the crop matures late. Control by insecticides has not hitherto been practicable because frequent treatments are required, and these are not economic. At Gayndah the value of DDT in the control of this pest was studied in an experiment which gave comparisons between untreated plots, plots dusted weekly with a 3 per cent. nicotine dust, and plots treated weekly with a 2 per cent. DDT dust. Results were obtained in all plots from nymphal counts on sample terminals each containing six leaves. Egg-laying was not inhibited by DDT, but nymphal developments did not proceed very far and recorded populations were therefore consistently low. In small-scale exploratory work on the related tomato jassid, *Empoasca terra-reginæ* Paoli, similar results have been obtained.

465. COTTON LEAFWORM: CONTROL BY DDT. By J. C. Clark. (*J. Econ. Ent.*, **37**, 1944, p. 144. From *J. Text. Inst.*, xxxvii, **6**, 1946, A226.) A 2 per cent DDT dust was ineffective against the cotton leafworm (*Alabama argillacea*).

466. COTTON LEAFWORM: CONTROL BY DDT. By E. E. Ivy and K. P. Ewing. (*J. Econ. Ent.*, **38**, 1945, p. 276. From *Summ. Curr. Lit.*, xxvi, **10**, 1946, p. 197.) DDT-pyrophyllite dusts failed to control leafworms infesting cotton plants, defoliation occurring even with three applications of DDT (8 per cent.) at 16 lb. per acre. A 2 per cent. dust was only about a third as effective as Ca arsenate or a Ca arsenate/S (1:1) dust. The residual effect of DDT gave up to 74 per cent. reduction, but still failed to prevent defoliation of the plants.

467. FURTHER OBSERVATIONS ON HOST PLANTS OF THE PINK BOLLWORM IN THE LOWER RIO GRANDE VALLEY OF TEXAS AND MEXICO. By A. J. Chapman and I. Moreno. (*J. Econ. Ent.*, **38**, 5, 1945, p. 583. From *Exp. Sta. Rec.*, **94**, **5**, 1946, p. 641.) Observations on secondary host plants were continued through 1943-44. A few among large collections of wild mallow plants held for later examination carried resting-stage larvæ of the pink bollworm which emerged in February and March, indicating that this host plant might serve as a source of infestation to cotton. A heavier infestation than previously observed was found on okra. A considerable number of larvæ were likewise found on a large collection of another mallow (*Pseudabutilon lozani*), and it was definitely proved that the pink bollworm developing on this host can transfer to cotton. One mature larva was found on green and dry seed pods of *Hibiscus cardiophyllus*—a new record for the Rio Grande Valley. *H. mutabilis* and *Malvaviscus arborus* were also found recently as secondary hosts. Many negative results from examining the mallows discussed and other potential wild and cultivated hosts were obtained but are not reported here. Infestation of secondary host plants depends on the intensity of infestation in cotton, their proximity to cotton fields, and the time of year when these hosts fruit. The most favourable time for infestation of secondary hosts is the fall. The importance of these plants in maintaining infestations in the area under study has not yet been established.

468. SOME ASPECTS OF INSECT PARASITES AND PREDATORS. By T. W. Kirkpatrick. (*E. Afr. Agr. Jour.*, xii, **1**, 1946, p. 11.) The author states that "the article is intended to be interesting rather than of practical utility." The subject is dealt with under the following headings: The Prevalence of Entomophagous Habits. The Habits of Predaceous Insects: actively searching for their prey; comparatively inactive insects; inactive insects which wait for their prey to come within reach; social predators. The Habits of Parasitic Insects: parasites that do not cause the death of their host; eggs laid in a situation remote from the host; eggs laid externally

on the host; eggs laid inside the body of the host, the resulting larvæ always being endoparasitic; social parasites.

469. EUPHORINE PARASITES OF CAPSID AND LYGÆID BUGS IN UGANDA (HYMENOPTERA, BRACONIDÆ). By G. E. J. Nixon. (*Bull. Ent. Res.*, 37, 1, 1946.) An attempt is made by the author to deal systematically with a number of Braconids belonging to the subfamily *Euphorinæ* and reared by Dr. T. H. C. Taylor in the course of his investigation into the biology of the Capsid pests of cotton in Uganda. To get a better idea of the relationships between the species, material from other parts of Africa has been studied, and descriptions of two new species from Cape Province are included. In all, ten new species of *Euphorinæ* are described, and they are distributed in two genera. A list of the known African species, which the author has been unable to recognize from the literature, is given at the end of the paper.

470. SOUTH CAROLINA: REPORT OF COTTON RESEARCH SUB-COMMITTEE ON COTTON DISEASES. By G. M. Armstrong *et al.* See Abstract 410.

471. A PRELIMINARY LIST OF PLANT DISEASES IN THE ANGLO-EGYPTIAN SUDAN. By A. S. Boughey. (Imp. Mycol. Inst., Kew, 1946. Price 3s. Mycol. Pap. No. 14. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 250.) A useful list of diseases of the economic plants of the Anglo-Egyptian Sudan compiled from the records of the Dept. of Agriculture and Forests and from various published works. The host plants are arranged alphabetically under their English names, and under each plant the diseases are similarly listed by their scientific names. In the index, hosts and parasites are arranged under their scientific names, and whenever possible the common Sudanese Arabic names for the crops are included. Information is also given on the distribution of the diseases.

472. INDAGINI TOSSICOMETRICHE SUGLI ANTICRITTOGAMICI. I-XXII. (*Atti. Ist. bot. Univ. Pavia*, Ser. 5, 1943, 1944. From *Rev. App. Mycol.*, xxv, 5, 1946, p. 221-4.) A series of papers by various authors, describing toxicometric researches on fungicides begun in 1941 at Florence and continued at the Centre of Fungicidal Studies, Pavia. The nature of the difficulties involved in the problem is discussed in detail.

473. VOLATILE SOIL FUMIGANTS FOR PLANT DISEASE CONTROL. By A. G. Newhall. See Abstract 444.

474. FUNGICIDES AND THEIR ACTION. By J. G. Horsfall. (Chron. Bot. Co., Waltham, Mass., 1945. From *Exp. Sta. Rec.*, 95, 1, 1946, p. 61.) This textbook is designed to consider two basic problems, "(1) to procure the proper materials for killing the enemy, and (2) to deliver them to him in sufficient quantity when and where he is vulnerable." These two problems are discussed in the light of the chemistry and physiology of toxic action and of the mechanics of application. The illustrative examples, in general, are drawn from plant pathology, but in many cases reference is made to wood and fabric preservation, human pathology, bacteriology, and entomology. A bibliography of 22 pages and author and subject indexes are provided.

475. OBSERVATIONS ON THE GROWTH OF SOME COPPER-TOLERANT FUNGI ON COTTON FABRICS. By C. H. Bayley and M. W. Weatherburn. (*Amer. Dyes. Rptr.*, 34, 13, 1945, p. 247. From *Exp. Sta. Rec.*, 94, 6, 1946, p. 843.) Qualitative observations on their growth on light cotton fabric containing copper naphthenate indicate that *Chætomium globosum* and *Metarrhizium* are completely inhibited by contents of 0·3 per cent. and 0·5 per cent. copper as copper naphthenate, respectively, whereas the growth of *Aspergillus niger* is not inhibited over the whole range (0·005 per cent. to 0·8 per cent.) of copper content investigated. A potent cellulose-destroying species of *Penicillium* isolated from the soil has been shown to grow readily on samples of cotton fabric containing 0·3 per cent. copper both with and without wax. The activity of this organism and also that of *A. niger* is inhibited by the presence of 0·3 per cent. copper in the form of copper naphthenate plus 0·1 per cent. of mercury in the form of mercuric naphthenate.

476. EFFECT OF STORAGE CONDITIONS ON SURVIVAL OF *Colletotrichum gossypii*. By C. H. Arndt. (*Phytopathology*, xxxvi, 1, 1946, p. 24. From *Rev. App. Mycol.*, xxv, 6, 1946, p. 261.) Portions of two lots of cotton seed (Deltapine 11a and

Carolinadel No. 2) naturally infected by the anthracnose fungus, *Colletotrichum* (*Glomerella*) *gossypii*, were adjusted at the South Carolina Agricultural Experiment Station to moisture contents of roughly 8, 10, 12, 14, and 16 per cent., samples of each of which were placed in storage at 1°, 21°, and 33°C., as well as at the air temperature of Knoxville, Tennessee. After 12, 17, and 66 months under these conditions, seeds from the various samples were germinated at 24° to determine the extent of survival of the pathogen. After 5½ years' storage at 1°, over 75 per cent. infection developed on the seedlings arising from seeds kept at 8 per cent. moisture content, while a lower number tended to contract the disease with each consecutive increase in the humidity of the seed up to 16 per cent., at which the incidence ranged from 19 to 27 per cent. In these experiments the fungus generally lost its infective capacity before the viability of the seeds was perceptibly impaired. At higher temperatures survival was greatly diminished. Non-germinating seeds harboured principally *Fusarium moniliforme*, small percentages also being infected by *Aspergillus* spp., *Chætomium* sp., *Ophiotrichum* sp., and (at 14 and 16 per cent. moisture contents) *Rhizopus* sp.

477. Soil Factors Affecting Incidence of Root Knot. By R. R. Kincaid. (*Soil Sci.*, **61**, 1, 1946, p. 101. From *Exp. Sta. Rec.*, **94**, 6, 1946, p. 771.) Soil factors—physical, chemical, and biological—have a controlling influence on the occurrence and activities of the root knot nematode, especially when free in the soil as eggs or larvæ, and also on its effects on plants. Temperature, moisture, sunlight, aeration H-ion concentration, organic matter and biological control, and soil fertility are the primary factors discussed in this review (42 references). Effects of flooding and fallow and movement and distribution of the nematodes in relation to soil texture and other factors are also considered.

478. Some Preliminary Tests to Determine the Efficacy of Certain Substances when Used as Soil Fumigants to Control the Root-Knot Nematode, *Heterodera marioni*, Goodey. By J. R. Christie. (*Helminthol. Soc. Wash. Proc.*, **12**, 1, 1945, p. 14. From *Exp. Sta. Rec.*, **94**, 4, 1946, p. 493.) In the tests reported, the effects of single and mixed fumigants on inoculum placed at varying intervals from the point of injection are expressed in terms of the amount of gall production on the roots of indicator plants; the results are discussed and tabulated. Larvacide (chloropicrin) proved more satisfactory when infested roots had decayed; with DD and Dowfume G this factor did not seem so important. Though the killing range of DD varied slightly from test to test, this did not appear correlated with variations in soil temperature or moisture. Ethylene dibromide had a killing range (to 12 but not to 15 in.) as great as any material tried; for 1,1,2-trichlorethane the range was to 3 but not to 6 in. Except for these five materials, the tests failed to reveal any chemicals—alone or in combination—possessing appreciable killing power.

479. Nutritional Factors Affecting Cotton Rust. By N. J. Volk. (*J. Amer. Soc. Agron.*, xxxviii, 1, 1946, p. 6. From *Rev. App. Mycol.*, xxv, 6, 1946, p. 261.) Observations and tests from 1937 to 1943 in Alabama showed that the soil from field areas producing "rusted" cotton contained about half as much potash as that from adjacent portions on which the crop was healthy. The disease did not appear to be associated with boron, copper, zinc, manganese, or magnesium deficiency, and was eliminated by the application of potash to the soil at dosages of 48 to 96 lb. per acre. Sodium nitrate alleviated the disorder but failed to control it in severe cases, while its incidence was increased by heavy applications of phosphorus. "Rust" assumed an acute form on land from which several groundnut crops had been dug, reducing the exchangeable potash content to very low levels. Potash acted more effectively when applied before planting than as a side-dressing. The anti-rust treatment retarded the maturity of the crop to a degree permitting of substantial boll weevil damage.

480. The Periodic Partial Failures of American Cottons in the Punjab: Their Causes and Remedies. By R. H. Dastur. (Pubd. by Ind. Cent. Cott. Comm., Bombay. Price: Rs. 5-8.) The main findings of the investigations on the partial failures of American cottons in the Punjab have been embodied in this

volume. The detailed results of each line of investigation are given in the scientific papers either already published or in course of publication in the *Ind. Jour. of Agricultural Science*. The various chapters are headed: Introduction. Variations in the yields of seed cotton. *Tirak* on light sandy soils deficient in nitrogen. *Tirak* on soils with saline subsoil. Growth studies on *Tirak*-affected crop. Artificial reproduction of *Tirak*. Physiological chemistry of *Tirak*-affected 4F plants. Remedial measures for *Tirak*. Manuring of cotton in the Punjab. Relation of weather factors with the spread of *Tirak*. Conclusions. A bibliography of the literature bearing on the different aspects of the work is included.

[*Cf.* Abstrs. in Vols. XVI., XIX., XX., XXI., XXII. of this Review.]

481. Virus Diseases of Plants. By F. C. Bawden. (*J. Roy. Soc. Arts.*, xciv, 4710, 1946, p. 136. From *Rev. App. Mycol.*, xxv, 7, 1946, p. 290.) In this paper, based on three lectures delivered before the Royal Society of Arts in November and December, 1945, the writer, after an introductory discussion of the meaning of the term "virus," deals with the external symptoms of virus diseases in plants, virus strains in the field, seed transmission, purification, chemical and physical properties, sizes of virus particles, and multiplication.

482. Bacterial Viruses or Bacteriophages. By M. Delbrück. (*Biol. Rev.*, **21**, 1946, p. 30. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 121.) Papers published during the last three years on the viruses affecting bacteria are reviewed. Bacterial mutation to virus resistance, the physiological nature of resistance, and virus mutation affecting the host range are among the problems discussed.

483. Soil Management and Plant Nutrition in Relation to Disease Development. By J. C. Walker. (*Soil Sci.*, **61**, 1, 1946, p. 47. From *Exp. Sta. Rec.*, **94**, 6, 1946, p. 769.) The present status of knowledge gives an indication that plant nutrition is one of the environal factors which—along with others—may have a measurable effect on the course of disease development. "What we need is more intensive research both under controlled nutrient culture and in the field with specific hosts and their parasites before we may expect to have a basis for generalization." In this review (24 references) the author's discussion revolves principally around the *Fusarium* wilt diseases, the reaction of two distinct types of disease to nutrition in the same host (cabbage yellows and clubroot), and soil reaction. There is believed to be little hope that soil management and fertilization will solve any large percentage of problems in plant disease control, but studies of host nutrition in relation to disease development may yield information of aid in modifying soil practices that may often be used to reduce the acuteness of disease losses.

GENERAL BOTANY, BREEDING, ETC.

484. Genetics. By E. Altenburg. (Henry Holt and Co., New York, 1945. $3·20. Reviewed *Pl. Bre. Abs.*, xvi, 2, 1946, p. 247.) This is a sound and useful general text-book of genetics covering the whole field of Mendelism, the necessary cytological background (including a study of the familiar types of abnormal behaviour), and modern practical developments such as induced mutation and polyploidy. The book is adequately illustrated. Each chapter ends with a summary and a list of exercises. While the book would form very useful additional reading for the student of plant genetics, it is doubtful whether it would form the most suitable main text. The principal types of behaviour all seem to be dealt with, and breeding methods and such subjects as evolution and population genetics are briefly discussed, but the book seems much richer in examples taken from animal genetics (particularly *Drosophila*), and one would like more thorough treatment of the plant side. An important defect in the reviewer's opinion is the absence of references to literature and of a bibliography. Errors appear to be few; one is the statement that the whole of the pea and bean family habitually self-pollinate.

485. Plant Breeding and Genetics To-day. By P. S. Hudson. (*Advance Sci.*, **3**, 1945, p. 252. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 117.) The rôle in plant breeding of selection, intraspecific and interspecific hybridization, and natural and artificially

induced polyploidy is described. The importance is shown of the impact upon genetics of recent findings in the chemical approach to biological problems, such as the nature of the virus, and a discussion is given of the significance of work by Russian scientists, notably Lysenko and Michurin, who base their investigations upon principles of non-Mendelian inheritance.

486. SOVIET BIOLOGY. By A. R. Zhebrak. (*Sci.*, **102**, 1945, p. 357. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 140.) In reply to a criticism by Sax of the position of genetics in the U.S.S.R., the author presents evidence of the progress being made to-day in Russian genetical research. It is pointed out that Soviet genetics is not to be confused with the genetical system of Lysenko, which the author regards as naïve and purely speculative. Although affirming the value of dialectical materialism in solving scientific problems, Lysenko's claim to have disproved Mendelism by its means is not regarded as well founded.

487. THE CYTOLOGICALA NALYSIS OF SPECIES HYBRIDS. II. By G. L. Stebbins, Jnr. (*Bot. Rev.*, **11**, 1945, p. 463. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 164.) A review, under several headings, of papers which have appeared during the last ten years on the cytology of various interspecific hybrids.

488. AN ATTEMPT AT A 'SYNTHESIS OF THE PHYSIOLOGICAL AND CYTOLOGICAL CONCEPTS OF THE GENE. By J. A. Serra. (*Bol. Sci. Broteriana*, **19**, Ser. 2a, 1944, p. 327. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 164.) Genetic and biochemical studies on the nature of inheritance are comprehensively discussed. The author accepts the gene as the unit of inheritance corresponding with the elementary chromomere, but suggests that the gene has a complex structure formed of one or more " active zones " and " intermediate linking zones," comparable with the alternating nucleoprotein chromomeres and protein interchromomeres. Point or gene mutation, minute genic rearrangements, and position effects are analysed on the basis of this hypothesis.

489. DER AUFBAU DER CHROMOSOMEN UND SEINE ABÄNDERUNG. By H. Bauer. (*Naturwissenschaften*, **75**, 1942, p. 300. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 168.) The validity of the contact and the break hypothesis is examined in detail with reference to the origin of chromosome mutations. Relevant literature is discussed.

490. THE PROBLEM OF SPECIES IN BOTANY AND THE WORKS OF ACADEMICIAN V. L. KOMAROV. By V. I. Poliansky. (*Priroda*, **5–6**, 1944, pp. 11-21. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 165.) This is a review of the book by Komarov entitled " The Doctrine of the Plant Species " published in 1940. The reviewer points out a number of the essential features of Komarov's concept of the species. Firstly, the species is regarded as a system which is developing, both in space and time, the ultimate unit being the individual, which by its multiplication gives rise to a tribe and ultimately a species. Hence we get the morphogeographical method of systematics, the essential criterion of a species being the possession of a distinct area of distribution, Different species may, however, be of a different status; new species generally represent a state of development, ancient species often a state of " being," their developmental period having passed long ago. Hybrid cycles and apomictic groups are regarded as systematic units distinct from that of a species and subject to different laws, and no attempt is made to submit them to the same treatment. The dialectical concept of the species as a developing system, which makes its use for purely practical purposes of systematics somewhat difficult, has been largely ignored in the International Rules of Botanical Nomenclature. The principle of phylogenetic series, which include not only species and varieties but even genera and higher categories, is the suggested solution for this problem. According to this principle, all forms, even though morphologically rather similar, are described as separate species if they have distinct areas. The species obtained are not all of equal weight and are arranged in series or collective species, comprising phylogenetically related species and often replacing the Linnean species. The series are then grouped into genera and so on. Komarov's final definition of species is " the species is a complex of generations which have arisen from a common ancestor and that under the influence of environment and the struggle for existence become distinct from the remaining

world of living beings through selection; in addition to this the species is a definite stage in the process of evolution." This effectively emphasizes the Darwinian factors of evolution in the definition of the species and distinguishes it from the definitions of many geneticists such as Heribert Nilsson, du Rietz, Cuenot, Hurst and Klinstedt. A further virtue of the Komarov species concept, it is claimed, is that it provides at the same time an adequate definition of the genus, family, and other systematic units.

491. Pflanzenzüchtung und Mutationsforschung. By H. Stubbe. (*Züchter*, **15**, 1943, p. 161. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 165.) The author discusses fully the value and applicability of induced mutation as a means of introducing variety into crop plants in order to obtain desirable types for cultivation or breeding purposes. The need for very large numbers of F_1 and F_2 plants and for repeating the induction processes several years in succession, is pointed out, as well as the danger of undesirable mutants arising owing to dysgenic mutation, use of old pollen or seed, etc. Mutation is also considered in relation to physiological races of pathogenic fungi and to the problems of virus research.

492. Heredity and its Variability. By T. D. Lysenko. (Trans. by T. Dobzhansky. King's Crown Press, New York, 1946. Reviewed by L. C. Dunn in *Sci.*, **103**, 1946, p. 180. From *Exp. Sta. Rec.*, **94**, 5, 1946, p. 609.) Calls attention to the author's contention that many characteristics are acquired from the environment and that any theories of heredity that do not recognize that fact must be discarded. Evidences of this condition are cited. The purpose of the book is to make available in English the merits of the Russian controversy and the effects on Darwin's and Mendel's theories of biology.

493. On Hypotheses of Fixation of Modifications by Heredity. By V. S. Kirpitchnikov. (In Russian. *Uspehi Sovremennoi Biologii*, **18**, 1944, p. 314. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 166.) In this discussion and review of the literature the author compares the various theories that have been put forward to explain the conversion, in evolution, of non-hereditary changes—modifications occurring in response to environmental stimulus—into hereditary changes, which occur independently of the environment. It is pointed out that the final stage of this evolution, where complete autonomy is found, occurs only in insects, the vertebrates representing an intermediate degree where the rôle of function is still quite important. A discussion of the various hypotheses that have been put forward by different authors to explain the phenomenon shows that very little concrete evidence exists regarding the mechanism of the conversion of a dependent to an independent character, apart from the data of Kamsilov and of Naumenko. The results of Gause, Smaragdowa, *et al.* are unfortunately confined to unicellular organisms. All the hypotheses that have been advanced, from Lloyd Morgan down to Waddington, are really variants of the same basic principle, that "adaptive modification is the result of previous natural selection and that natural selection can later fix these modifications and in some cases progressively stabilize the individual development." The importance of the contributions of Soviet scientists in building up a satisfactory hypothesis to explain the parallelism of hereditary and non-hereditary variation without recourse to Lamarckian interpretations is emphasized.

494. The Internal Infection of Cotton Seed and the Loss of Viability in Storage. By C. H. Arndt. (*Phytopathology*, **36**, 1, 1946, p. 30. From *Exp. Sta. Rec.*, **94**, 5, 1946, p. 627.) When loss of viability of cotton seeds of less than 14 per cent. moisture content was indicated by germination tests, negligible proportions of the still viable seeds were infected by micro-organisms and many of the non-viable seeds were not infected; thus micro-organisms were not the primary cause of deterioration. The various types of abnormal seedlings produced indicated that meristem of the primary root was the first portion of the embryo to lose its capacity for indefinite growth during storage, although it usually maintained its capacity for limited growth longer than meristem of the hypocotyl.

495. The Longevity of Cotton Seed as Affected by Climate and Seed Treatments. By D. M. Simpson. (*J. Amer. Soc. Agron.*, xxxviii, 1, 1946, p. 32,

From *Rev. App. Mycol.*, xxv, **6**, 1946, p. 261.) In the course of an investigation extending over a period of seven years on the influence of climatic factors and seed treatments on the longevity of Stoneville 2 cotton seed in various locations in the United States Cotton Belt, it was ascertained that fuzzy samples had a slightly lower moisture content than acid-delinted, and averaged rather higher in germination. Seed treated with 2 per cent ceresan germinated better than untreated, probably because of the control in the former of *Mucor* and other fungi. This fungicidal treatment was definitely not deleterious to stored cotton seed.

496. THE EXCHANGE OF ATTRIBUTES BETWEEN ALLELES. By R. A. Silow. (Pap. Genet. Soc., London, 4/1/46, p. 3. Mimeographed. From *Pl. Bre. Abs.*, xvi, **2**, 1946, p. 130.) Anthocyanin pigmentation in *Gossypium arboreum* L. and *G. herbaceum* L. is determined by an extensive series of multiple alleles with pleiotropic effect upon several organs of the plant; 22 alternative anthocyanin patterns behaving as unit complexes in inheritance are now recognized. The anomalous segregates which rarely occur can only be adequately explained as having arisen by the recombination of parental attributes. It is suggested that in view of the extreme multiple allelism, the pleiotropy, and instability characterizing anthocyanin inheritance in several diverse plant families, anthocyanin development is controlled by a single gene of a complex nature, rather than by an allelic system of distinct genes.

497. AN ORANGE-COLOURED PIGMENT OF COTTONSEED. By C. H. Boatner *et al.* (*Jour. Amer. Chem. Soc.*, **66**, 5, 1944, p. 838. From *Exp. Sta. Rec.*, **94**, 5, 1946, p. 582.) The authors isolated an orange-coloured pigment from an ether extract of cotton seed. The extract was re-extracted with a dilute aqueous solution of sodium hydroxide containing sodium dithionite ($Na_2S_2O_4$). The yellow-coloured ethereal layer which separated from the aqueous extract when it was exactly neutralized with concentrated hydrochloric acid was withdrawn. Addition of an equal volume of glacial acetic acid to the ethereal solution caused the rapid precipitation of gossypol "acetate." When the filtrate was allowed to stand for about a week, an orange-coloured solid slowly precipitated. This solid was extracted with hot acetone, from which orange-coloured crystals precipitated on cooling. The product was recrystallized first from hot acetone and finally from a mixture of hot chloroform and ether. The new pigment was found less soluble than gossypol in most organic solvents. It melted at 212° (cor.) to form a more deeply coloured solid, which melted with decomposition at 238°-239°. It was insoluble in alkali. It did not form a precipitate with aniline, reduce Fehling solution, or give a positive fuchsin-aldehyde test. The orange-coloured pigment reacted with hydroxylamine and with dinitrophenylhydrazine, but the products differed in melting point from the corresponding products obtained with gossypol. Absorption spectra of the new pigment (including a well-defined maximum at 435 mμ) and of an unstable antimony trichloride derivative (maximum at 450-460 mμ) differed from those of gossypol, but a chloroform solution treated with hydrochloric acid and then with antimony trichloride produced an absorption spectrum the same as that given by gossypol under like treatment. This is held to indicate conversion of the new pigment into gossypol by hydrochloric acid.

498. ZUR FRAGE DES AUFBAUES DER PRIMÄRWAND DER BAUMWOLLHAARE. By K. Hess *et al.* (*Planta, Arch. Wiss. Bot.*, **33**, 1, 1942, p. 151. From *Exp. Sta. Rec.*, **94**, 5, 1946, p. 608.) Based on the previously known chemical and physical properties of the primary wall of the young cotton fibre, a model of its structure is derived and discussed. There are 16 references.

499. EFFECT OF VARIETY, LOCATION, AND SEASON ON OIL, PROTEIN, AND FUZZ OF COTTONSEED AND ON FIBRE PROPERTIES OF LINT. By O. A. Pope and J. O. Ware. (*U.S. Dpt. Agr. Tech. Bull.* 903, 1945. From *Exp. Sta. Rec.*, **94**, 6, 1946, p. 756.) Studies on samples from 16 varieties of cotton grown at 11 to 14 locations 1935-37 dealt with the relative effects of varieties, locations, and seasons, and the interactions of these main effects on oil and protein content of cotton seed, amount of fuzz on the seed, and on the various fibre properties. Comparatively wide differences were identified in each year among locational means and varietal averages for all of the

variables. The rank of varieties was relatively consistent for the different locations and seasons in average percentage of oil, protein, fuzz, fibre length, and fibre maturity. The order or rank of station averages, however, varied widely among years for all variables, indicating that ecological effects depend largely on weather conditions during the growing season and comparatively little on the soil series or types represented. Percentages of oil and protein were substantially independent among the varieties, but were negatively associated when effects of environment were considered. Length and weight per inch of fibre depended largely on the genetic constitution of varieties, although growth conditions exerted rather important effects. Tensile strength and percentage of immature fibres were largely dependent on growth conditions, although marked varietal differences were identified. In all the fibre properties studied it was definitely evident that the genetic constitution of varieties is the most important controllable factor. Consequently, fibre characteristics should be carefully examined in any breeding programme, so that those that contribute to the quality of the manufactured product may be associated with desirable yield factors in the development of new strains and varieties. It was also clear that oil, protein, and fuzz are all dependent on genetic constitution, and that a consideration of these variables in the breeding programme should result in the isolation of lines superior in any one or all of the characteristics.

500. A CONTRIBUTION TO THE STUDY OF HEAT RESISTANCE OF THE LEAVES OF COTTON GROWN ON SALINE SOILS. By A. Kleshnin. (*C.R.* [*Dok.*] *Acad. Sci., U.S.S.R.*, n. ser., **47**, 8, 1945. From *Exp. Sta. Rec.*, **95**, 1, 1946, p. 36.) By the procedure used, leaves of a definite internode are cut off and placed in a beaker of water; the temperature of the water is gradually raised to 55° C., and the leaves are kept at 55°-60° for ten minutes. After this they are transferred to containers of cold water, which is replaced by 0·2 N HCl. The appearance of yellow spots under the influence of the acid is considered an index of the heat resistance; the earlier they appear, the lower the resistance of the leaves tested. Experiments with different concentrations of HCl into which the petioles of cotton leaves were dipped for 2·5 hr. indicated that the decrease in heat resistance paralleled the concentration of the salt in the medium. The heat resistance of leaves on different internodes proved of considerable significance; the maximum resistance occurred in leaves of the mid-internodes; the minimum in the lowest and uppermost leaves.

501. THE BIOLOGY OF FLOWERING OF COTTON. By D. V. Ter-Avanesjan. (In Russian. *Sov. Pl. Indus. Rec.*, **5**, 1940, p. 181. From *Pl. Bre. Abs.*, xvi, **2**, 1946, p. 208.) Cross-pollination of cotton is mainly entomophilous. A study of insect visits and the resulting cross-pollination was made in 1937 on 410 flowers, 286 of which formed bolls. Of the latter 163 belonged to a green-leaved variety 0246 and the rest to the red-leaved Wine Sap. In 1938 seed of both varieties was sown and 3,836 plants of 0246 were obtained, of which 55 were hybrids, *i.e.* 0·69 per cent. The 123 bolls of Wine Sap produced 2,985 plants comprising 32 green-leaved hybrids, *i.e.* 1·01 per cent. A repetition of the observations was made in 1938 to collect data on the numbers of insect visitors and the time of the visit. The percentage of cross-pollination on this occasion was 0·90 for 0246 and 2·32 for Wine Sap, while the percentages for the hours from 10-11, 11-12, and 12-1 were respectively 0·48, 0·33, and 0·09 for 0246 and 1·28, 0·83 and 0·12 for Wine Sap. Wine Sap alone showed any crossing (0·09 per cent.) at 9-10 a.m., and neither variety produced any hybrid plants as a result of visits from 1-3 p.m. Jakontov's findings on the same subject are criticized. The time of flowering and the fertilization period of the same flower may vary in accordance with the geographical and climatic conditions.

502. FRUITING AND SHEDDING OF COTTON IN RELATION TO LIGHT AND OTHER LIMITING FACTORS. By A. A. Dunlap. (*Bull. No.* 677, Texas Agr. Exp. Sta., 1945.) Cotton plants become well fruited under conditions that favour the production of a large number of blooms, little shedding, and moderate vegetative growth. The studies reported show that adequate sunlight is an important factor in these conditions. Variations in the amount of light, such as accompany periods of cloudy weather, short days, and close spacing of plants, were found to result in impairment of fruiting

and excessive vegetative growth. The heavy shedding of young bolls often noted by growers following periods of rainy weather is probably due to the interruption in high sunlight intensity rather than to the direct effect of rain on the flower. Modified light conditions and other factors that induce shedding have been found to hinder photosynthesis and to reduce the carbohydrate content in cotton leaves. Differences in the sensitiveness of cotton varieties to unfavourable light conditions indicate the importance of careful selection of varieties for a given region, according to prevailing weather conditions during the fruiting season, and the need for attention to these inherent varietal differences by the cotton breeder.

503. THE EFFECT OF PUNCTURING AND SUCKING INSECTS ON THE SHEDDING OF THE FRUITS OF COTTON. By N. I. Demidov. (In Russian. *Izv. uzbek. Fil. Akad. Nauk. U.S.S.R.*, 1940. From *Rev. App. Ent.*, xxxiv, Ser. A. **5**, 1946, p. 154.) Much of the potential yield of cotton in Bokhara is lost owing to the shedding of fruiting forms. This is commonly ascribed to insufficient or unseasonable irrigation, but since it is considerable in fields that are correctly irrigated, observations on its cause were carried out in an experimental field in 1939. They showed that from 33 to 62 per cent. of the potential yield is lost owing to the feeding of Aphids in June and of *Heteroptera* in summer and autumn, the species collected in August-October being *Dolycoris penicillatus*, Horv., *Lygus pratensis*, L., *Brachynema germari*, Kol. (*virens*, Klug.), *Eurydema festivum*, L., *Adelphocoris lineolatus*, Goeze, *Corizus hyoscyami*, L., and *Deræocoris* (*Camptobrochis*) *punctulatus*, Fall. On cold mornings in October, nymphs and adults of most of the bugs occurred on the plants between the bracts and the young bolls. The stalks of most of the fallen buds, flowers, and young bolls had been injured by insects, and all those so injured were shed. Older bolls survived, but did not develop to the full size, and the fibre was short and poor in quality. The conclusion that punctures by insects are a direct cause of shedding was confirmed by an experiment in which the stalks of buds, flowers, and young bolls were punctured with a needle and dropped 6-10 days later. Bolls 2 cm. in diameter remained on the plants, but opened prematurely and produced inferior cotton.

504. THE EFFECTIVENESS OF INTRAVARIETAL CROSSES IN COTTON. By D. V. Ter-Avanesjan. (In Russian. *Sov. Pl. Indus. Rec.*, 1941, **1**, p. 35. From *Pl. Bre. Abs.*, xvi, **2**, 1946, p. 207.) The accepted system of seed production for cotton in the Soviet Union is described and discussed. It is pointed out that atypical plants arise even at stations where seed production is confined to a single variety. This the author ascribes to the reduction of genetic plasticity by excessive single-plant selection. Comparisons were made between the yields from progeny obtained by open pollination, artificial pollination, and intravarietal crossing with a pollen mixture; it was found that the plants from intravarietal crossing were more vigorous and uniform in development. Different varieties responded differently to intravarietal crossing. An experiment was made in which ten minutes after the application of the pollen mixture, pollen from another red-leaved variety was placed on the stigma. In this way the selectivity was measured by the number of hybrid seedlings in the progeny. The selectivity was found to correspond closely to the degree of response to intravarietal crossing.

505. SOME HYBRIDIZATION EXPERIMENTS IN THE TRIBE *Hibisceæ*. By A. Skovsted. (*C.R. Lab. Carlsberg*, 1944, **24**, Ser. Physiol., 1-30. From *Pl. Bre. Abs.*, xvi, **2**, 1946, p. 208.) Hybridization and grafting experiments have been carried out involving 26 species of *Hibiscus*, 18 species of *Gossypium*, and one species of each of the following genera: *Kostelzkya*, *Cienfuegosia*, *Thespesia*, and *Gossypioides*. No intergeneric hybrids were obtained. The classification of the genus *Hibiscus* is discussed in the light of the various relationships indicated by the data of the hybridization and grafting experiments. The hybrids obtained by crossing *Gossypium Klotzchianum* with *G. Davidsonii*, *G. Stocksii*, *G. anomalum*, and the F_1 hybrid *G. barbadense* × *G. arboreum* are described and the results of all the hybridization work with the 18 species of *Gossypium* are summarized diagrammatically. The interrelationship of the different Old and New World species is discussed, and a diagram is presented illustrating the probable course of their evolution.

506. The Significance of the Results of Research on Polyploidy for Plant Breeding. By R. Griesinger. (In German. *Ber. dtsch. bot. Ges.*, **60**, 1943, p. 36. From *Pl. Bre. Abs.*, xvi, 2, 1946, p. 173.) This review of recent research on the utilization of polyploidy in breedings lays particular emphasis on the possibilities of obtaining larger plants with more valuable chemical constitutions, and on its usefulness in restoring fertility to F_1 hybrids and their progeny.

507. The Effect of Colchicine and Acenaphthene in Combination with X-Rays on Plant Tissue. I. Introduction. By M. Levine. (*Bull. Torrey Bot. Cl.*, **72**, 1945, p. 563. From *Pl. Bre. Abs.*, xvi, **2**, 1946, p. 168.) A review of papers dealing with the effect of colchicine and other substances, and of colchicine in combination with X-ray treatment, upon mitosis in both normal and pathological plant and animal tissues.

508. Occurrence of Gossypol. By K. Visweswara Rao and R. Vasudeva Sarma. (*Curr. Sci.*, **14**, 1945, p. 270. From *Pl. Bre. Abs.*, xvi, **2**, 1946, p. 131.) The gossypol content has been extracted by an improved method from the seed, root bark, and stem bark of different *Gossypium* species. The root bark gave high yields of gossypol, and is a convenient source of extraction since, unlike the seed, it is oil-free. The gossypol extracts of the seed and root bark were found to be identical. No significant amounts of gossypol were extracted from the stem bark. The occurrence of gossypol appears to be restricted to the species of *Gossypium*.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

509. The Chemistry of Cellulose. By E. Heuser. (John Wiley and Sons, Inc., New York. Chapman and Hall, London, 1945. $7.50. Reviewed *Nature*, 4/5/46, p. 568.) From this review we give the following extracts: "The chapters on the microscopic and submicroscopic structural arrangements in the cellulose fibre serve to illustrate the difficulty and complexity of the problems which remain to be solved before the gap which exists between the biological and the chemical approaches to the study of cellulose can be bridged. These chapters are well illustrated by striking photomicrographs, which would, however, have been still more useful if the degree of magnification had been included in each case. It is a natural step from a consideration of the organized colloidal structure which is present in a cellulose fibre to a discussion of the reactions of cellulose with water and then with aqueous alkalis. These two chapters are followed by an account of the interactions between cellulose and organic bases, ammonia, and concentrated salt solutions, leading up to the chapter on the action of cuprammonium hydroxide. A detailed account of the chemistry of the cellulose esters, including xanthates, occupies almost a third of the volume. Next in order comes a chapter on the cellulose ethers, and this is followed by an extensive treatment of the oxidation phenomena displayed by cellulose. There are chapters on the decomposition of cellulose by acids and by heat, and an interesting account is given of the decomposition of cellulose by biological processes. Finally, the volume is rounded off by two chapters in which a concise summary is given of the work bearing on the chemical structure of cellulose and on the molecular weight of the native material and of various degradation products. The material contained in these chapters serves to give the reader a comprehensive review of cellulose chemistry in which special emphasis has been laid on underlying scientific principles rather than on practical industrial applications. . . . The author is to be congratulated on the presentation of such a clear and readable account of an extremely complicated subject."

510. Dielectric Properties of Raw Cotton. By W. L. Balls. (*Nature*, 6/7/46, p. 9.) In connection with a project for using thermionic heating on the 80 ovens of the Alexandria Testing House, the dielectric properties of cotton at various moisture contents have been evaluated. The enquiry has been extended by measuring the dielectric "constant" in fields which traversed the hair lengthways instead of the usual transverse direction. The technique is described. Results showed that the values are twice as large lengthways, the "*K*" of cotton dried at 100° C. being about

six longitudinally and three transversely. It is not surprising that such a structure as the cellulose wall of the cotton hair should be electrically anisotropic, and the results obtained have some interest for interpretation of the properties of all fibrous materials, including wood. Various sources of error are discussed.

511. Measurement of Cotton Fibre Strength by the Flat Taped Bundle Method. By J. C. Barnes and J. P. Elting. (*Text. Res. J.*, **16**, 1946, p. 115. From *Text. Tech. Digest*, **3**, 6, 1946, p. 299.) The flat taped bundle test as applied to measurement of the strength of cotton fibres is discussed; techniques and apparatus are described in detail. The effects of varying bundle width, weight, direction of fibre, jaw pressure and separation, humidity, and type of tape have been studied. A calibration method is described which reduces greatly the human factor when there are several operators.

512. Structure and Plasticity of Undried Cotton Fibres. By E. E. Berkley and T. Kerr. (*Ind. Eng. Chem.*, **38**, 1946, p. 304. From *Text. Tech. Digest*, **3**, **4**, 1946, p. 154.) X-ray patterns of undried cotton fibres taken from developing bolls show little or no evidence of crystalline cellulose. When first dehydrated the pattern of native cellulose appears. The fibres possess considerable plasticity. When stretched the slope of the cellulose spiral in the secondary wall and the fibre strength are increased. Tension causes some crystallization of the cellulose even in fibres which have never been dried. With a view to preventing crystallization of cellulose upon drying, undried cotton fibres are impregnated with strong glucose solutions. Fibres so impregnated and dried without tension show diffraction lines from both glucose and cellulose oriented with respect to the long line of the fibre. When the fibres are stretched, certain other lines in the X-ray pattern appear in addition to the glucose and cellulose lines. Flax fibres, unlike cotton, show some crystallization before dehydration.

513. Cotton Blending. By S. Williams and J. D. Towery. (*Text. Res. J.*, **16**, 1946, p. 61. From *J. Text. Inst.*, xxxvii, **6**, 1946, A227.) Twenty-nine different blends involving two-bale mixes of two varieties of cotton, Hi-Bred and Bobshaw No. 1, both varieties represented in grades "middling white" to "strict, good ordinary white," were studied. The effects of various combinations of these grades and staples on spinnability, yarn lea strength, yarn appearance, and manufacturing waste have been noted. In general, the deleterious effects of offgrade were offset by an increase in staple length of the low-grade type in spinning coarse-to-medium counts. A considerable economic advantage is obtainable through the strategic blending of various grades and staples of cotton over a very wide range. The data include: Fig. 1, a plot of Memphis spot cotton quotations for various staples from $\frac{13}{16}$ to $1\frac{1}{4}$ in. in the different grades; Figs. 2-4, diagrams to show the effect of varying the composition of the mixing and the twist factor within a mixing on corrected lea strength in 11s, 22s and 33s counts; Figs. 5 and 6, diagrams to show the effect of the various spinning processes on the staple length of two of the mixings; Table I, corrected lea strengths, standard deviations and yarn quality ratings for the various yarns; Table II, fibre characters, card waste percentages, and nep counts.

514. Fibre and Spinning Properties of Cotton at Progressive Stages of Development. By E. E. Berkley. (*Text. Res. J.*, **15**, 1945, p. 460. From *Text. Tech. Digest*, iii, **3**, 1946, p. 144.) Results of experiments on structural and physical properties of cotton fibres with respect to fibre and spinning properties are reported and discussed. X-ray angle, fibre strength, length, fineness, and percentage of thick-walled fibres are determined and cross-section studies made.

515. Cotton Spinning. By R. Howard. (*Text. Mfr.*, **71**, 1945, p. 515. From *Text. Tech. Digest*, iii, **3**, 1946, p. 118.) High drafting in cotton spinning is discussed from the point of view of costs and economies of operation achieved. Needs of individual mills should be determined by actual mill tests.

516. Cotton Laps: Drawing. By Platt Bros and Co. Ltd. (*Text. Mnfr.*, **72**, 1946, p. 134. From *Summ. Curr. Lit.*, xxvi, **10**, 1946, p. 198.) The well-blended and uniform laps that can be produced by single-process automatic lap-forming machinery make it usually unnecessary to insist on the orthodox three passages of

drawing to attain weight regularity and perfect blending in the card and subsequent sliver. Where some small sacrifice of fibre parallelization can be allowed, use of the lap drawing process has distinct advantages. The lap former and the lap draw frame are described.

517. Cotton and Spun Rayon Yarns: Determination of Contraction on Twisting. By M. Duhamel. (*L'Ind. Text.*, **63**, 1945, p. 48. From *Summ. Curr. Lit.*, xxvi, **10**, 1946, p. 198.) A brief discussion of the essential points from a book by J. A. Colin on the twisting of yarns. The absolute contraction during twisting and the effective contraction are defined. It is stated that yarns spun from the same fibres to different counts but the same twist factor all show essentially identical contractions independent of the twist. Two charts are given showing the twist contractions of various cotton varieties and rayon staple.

518. Cotton Wax, Properties and Constituents: Solubility in Common Solvents. By W. H. Toun, Jnr., and E. P. Schoch. (*Ind. Eng. Chem.*, **38**, 1946, p. 413. From *Text. Tech. Digest*, iii, **4**, 1946, p. 202.) Cotton wax extracted from batches of Texas cotton with hot benzene differs from most commercial waxes in that it is not predominantly an ester, but contains smaller amounts of fatty acids. Its dark colour and unpleasant odour can be removed by bleaching agents. It blends well with other natural waxes and resins and can be used in many industrial applications. Certain solvents (acetone and alcohols up to $4C$) divide the wax into soluble and insoluble fractions. Cotton wax is not so soluble in these materials as in aromatics and in chlorinated alipathic solvents, methanol being the poorest solvent of the group studied, $CHCl_3$, CS_2, and turpentine the best. The portions of the wax insoluble in alcohols are hard resin-like substances, dark in colour, melting above 100° C.

519. Quantitative Determination of Extractable Gossypol in Cottonseed and Cottonseed Meal: A Spectrophotometric Method. By C. H. Boatner *et al.* (*Indus. and Eng. Chem., Analyt. Edn.*, **16**, 9, 1944, p. 566. From *Exp. Sta. Rec.*, **95**, 1, 1946, p. 14.) The authors point out that the reaction of gossypol with antimony trichloride in ether and chloroform extracts of cottonseed is specific and the reaction product is sufficiently stable to permit accurate spectrophotometric determination of the gossypol concentration of such extracts. A rapid direct method for determination of free gossypol in cottonseed is reported, the gossypol being extracted by equilibrating ground cottonseed and chloroform, treating the extract with concentrated hydrochloric acid, and applying the antimony trichloride reaction directly to the treated extract.

520. Industrial Textile Research: Future. By M. Harris. (*Amer. Dyes. Rpt.*, **35**, 1946, p. 103. From *Summ. Curr. Lit.*, xxvi, **10**, 1946, p. 214.) Recent technological trends in the textile industry are analysed. The problems of who shall assume the responsibilities of leadership in research and development in the industry, and what are the technical problems of the industry, are discussed. The probable future developments of man-made and natural fibres and of chemical finishing methods are considered, and a new phase of work, which can be termed "physiology of clothing," is shown to influence developments considerably.

521. Juvenile Weavers: Instruction. By J. H. Yates. (*Text. Rec.*, **63**, 1946, pp. 57, 61, 65. From *Summ. Curr. Lit.*, xxvi, **10**, 1946, p. 214.) A course of instruction is given dealing with "catching the weft," tying a weaver's knot, "setting-on" or starting a loom, picking bands, and with leaving looms in good order when not in use. Some useful definitions are appended.

522. Textile Operatives: Work Assignment. By P. Mahieu and C. Florin. (*L'Ind. Text.*, **63**, 1946, p. 58. From *Summ. Curr. Lit.*, xxvi, **10**, 1946, p. 214.) A time and motion study is presented that enables the calculation of the number of spindles or looms which can be supervised by one worker, the optimum speed of the machines, the output of each individual worker, and the efficiency of the machines.

MISCELLANEOUS.

523. THE TEXTILE INSTITUTE. (Issued by the Council of the Textile Institute, Manchester, March, 1946.) An account of the objects, activities, status, and membership of the Textile Institute, which was founded in 1910 in order to create a technological body worthy of the traditions of the important textile industry, and to advance the general interests of the industry more particularly in relation to the acquisition and application of scientific knowledge. The Textile Institute was incorporated by Royal Charter in 1925.

524. SKINNER'S COTTON TRADE DIRECTORY OF THE WORLD, 1946. (Pubd. annually by Thos. Skinner and Co. [Publishers] Ltd., London, Manchester, Bradford, Montreal, New York.) This is the twenty-third edition of this most valuable publication. Owing to the unsettled conditions still prevailing in Europe as a result of the recent hostilities, it has not been possible to obtain revised information regarding all the countries included in this Directory previous to the war. Information is included, however, covering Belgium, Denmark, France, Greece, and Holland, in so far as conditions now allow, and the task will be completed regarding these and the remaining countries as soon as business relations with this country become normal. The new feature, introduced in last year's edition, consisting of statistical tables relating to raw cotton, has proved of interest and value to subscribers, and following the removal of Government restrictions and prohibitions these statistics have been augmented in the present edition. The "Trade Marks Section," which is an alphabetical list of active Textile Trade Marks and Names owned principally by companies listed in the Directory, has been revised and augmented, and includes a considerably extended list of Canadian and United States Textile Trade Marks and branded goods. The thumb holes, provided in the Directory for ease of reference, are labelled: Contents, Index; Advert. Index General Information; Exporters, Merchants; Spinners, Manufacturers, and Doublers; Directors (British); Dyers, Finishers; Merchant Converters; Fabrics; Silk and Rayon; Hosiery and Knit Goods; Hosiery Yarn Spinners, etc.; British Trade Marks; Canadian Trade Marks; U.S.A. Trade Marks; Mill Supplies. All headings, indices, and explanatory notes are printed in English, French, German, Italian, Spanish, and Portuguese. The Directory is absolutely indispensable to all those concerned in any way with the cotton industry. The price by post inland and abroad is £1 10s.; Canada and United States $7.50 (post and duty free).

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